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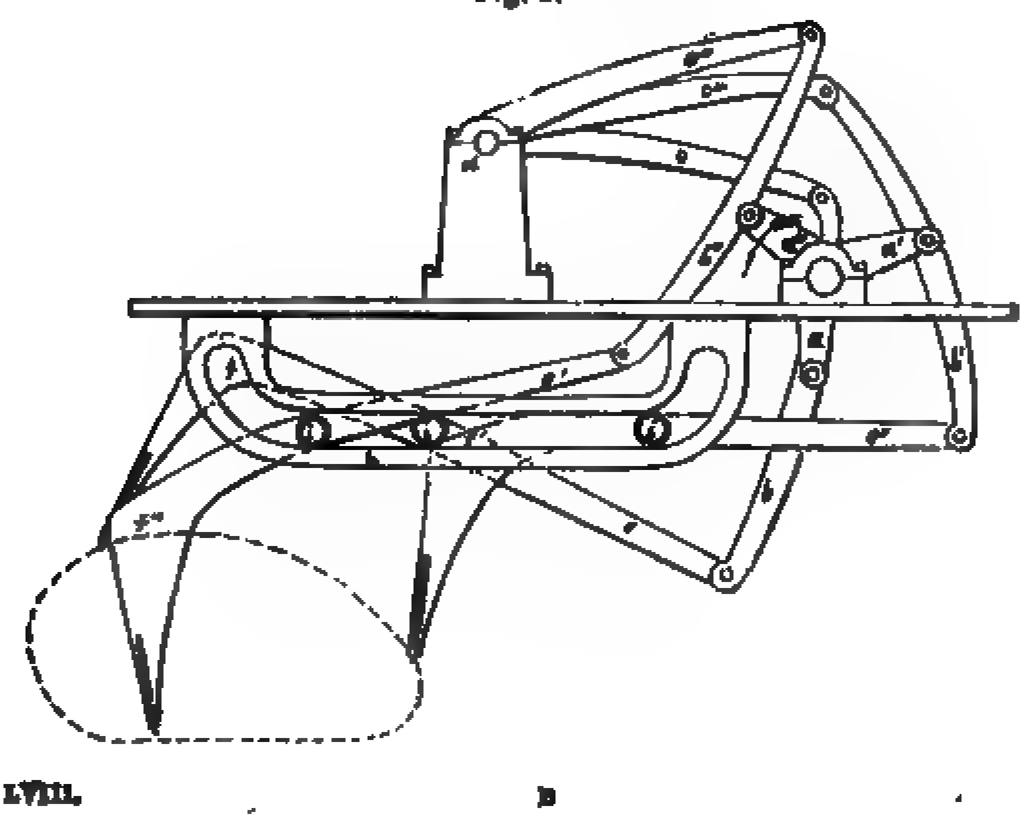
CROOKER'S PATENT STEAM-VESSEL PADDLES.

Fig. 1.

Fig. 2.



CROOKER'S PATENT STEAM-VESSEL PADDLES.

(Patent dated June 28, 1852. Specification enrolled December 28, 1852.)

The principle aimed at in this invention is, to produce a movement somewhat in imitation of that employed in Nature by aquatic birds for their propulsion—as ducks, geese, &c. In place of the contraction of the paddle, to represent the movement of the foot, the paddle is lifted from the water, but the propelling action is sought to be the same. Fig. 1 is a perspective view of a portion of the guard of a vessel having the propelling arrangements attached; and fig. 2 is a side elevation of the same, with a diagram tracing the path of the paddle during one revolution of the crank shaft. In the floor of the guard are three longitudinal openings, or more, according to the number of paddles and cranks. The main shaft is passed through the side of the vessel, and has affixed to it three cranks, as seen at a, a', a''. These cranks are arranged to form three equal angles, as respects each other, by which means one paddle is always in the water. A lever of the third class is next affixed to each crank, as seen at b, b', b''. The fulcra of these levers are at the ends of three arms c, c', c'', which have their axes upon a cross bar d, supported by the uprights d' d' upon each side of the guard. Beneath the guard the paddles are arranged upon levers supported on moving fulcra, which slide in guides parallel to the line of motion of the boat. These levers are seen at e, e', e'', one to each of the vertical levers b, to which they are fastened at the lower ends. The opposite ends of each of these horizontal levers are bent down at right angles, or nearly so, as shown at f; and the paddles g are attached by bolts or otherwise thereto. h is one of a series of guides to support the levers e upon their fulcrum i. A guide is placed upon each side of the levers, and the pin constituting the fulcrum extends across, one end resting upon each guide. Rollers are put upon the pins, to run upon the guides and diminish friction.

The operation of this arrangement is as follows:—Rotary motion being given to the main shaft, the cranks transmit the motion to the paddles through the intervention of the levers, by which means the paddles are made to describe a series of irregular curves, being figures compounded of the circular motion of the cranks with the angular throw of the levers. The best arrangement of levers would be such as would give to the paddle a direct horizontal motion during its immersion in the water, with a sudden curve at leaving and entering, and a constantly rising one during the time of its track through the air to renew its stroke upon the water, as is clearly shown in the dotted lines in Fig. 2. In addition to this, the vibrating motion of the horizontal levers e gives to the position of the paddles various angles during their rotation, whereby a movement is produced similar to that known as "feathering" during the operation of rowing by manual power. In Fig. 2 are seen the several angles assumed by the paddles in the different positions of the crank and levers. Thus while the paddle is in the water it is vertical in order to produce the greatest resistance; on leaving the water it inclines forward, and in this position it is withdrawn from the water, thus leaving it with the least disturbance, and again entering in like manner.

In addition to the angular positions of the paddles at different parts of their course, by which, as has been described, the horizontal and feathering movements are produced, the guides h can also be shaped to modify still further the motion of the paddle. Thus to accelerate the motion at the moment the paddle is about to leave or enter the water, which is obviously an advantage to accomplish, the groove h forming the slide, after proceeding horizontally for a greater part of the stroke, is rounded up at each end, as shown in the drawings. The fulcrum-pin i reaches this curve just before the termination of the stroke, and at the moment that one of the cranks being near its lowest point has thrown down one of the vertical levers b, projecting with it the attached end of the horizontal lever e. The fulcrum-pin i then enters the curve in the guide, and this upward movement of the fulcrum being in addition to the regular movement of the lever, causes the accelerated motion described; the entering motion is effected in the same manner.

ON THE CALCULATIONS USED IN MEASURING THE STABILITY OF SHIPS.

(COMMUNICATED BY DR. WOOLLEY, PRINCIPAL OF H.M. SCHOOL OF NAVAL CONSTRUCTION, PORTSMOUTH.)

THERE are now two different ways of considering the qualities of a ship as regards stability, and therefore two different modes of expressing it. The former of these we owe to the French writers of the last century, who taught us to regard a vessel as more or less stable according as the moment of the force which acts to bring it back to its original position, after it has been displaced, is greater or less. They contented themselves, it is true, with calculating this moment for very small angles of inclination. Attwood afterwards extended this method to angles of finite magnitude.

The second or dynamical measure of stability, which we owe to Professor Moseley, is the number of units of work necessary to incline the vessel through any angle. This is, of course, equivalent to the total effect of the forces which have been in operation in producing this inclination during the whole time of the vessel's moving from one position to the other. And since a sudden gust of wind or blow of a wave generates a certain amount of *vis viva* in the ship, which must be overcome by the forces which resist the inclination, it is evident that the work done upon the vessel by the fluid pressure from the position of rest to the extreme position of inclination, is a proper measure of the work done by the gust of wind or the blow of the wave. The chief use of calculating dynamical stability is, to ensure the ship from danger under such circumstances: if, therefore, a vessel whose form and qualities are well known has been ascertained to roll through a certain angle, say from 25° to 30°, in a violent storm, and this angle be taken as the limit to which a vessel may incline without danger, the designer should take care that the vessel he proposes should have at least an equal amount of dynamical stability for that angle of inclination.

Hence dynamical stability must be calculated for a very considerable angle.

Statical stability is an element of the utmost importance for all ships—for a vessel deficient in it cannot be very weatherly; neither could it, if a vessel of war be able, under many circumstances, to use its lower guns, where a vessel of more stability would have this power, and therefore have a decided superiority over the former. It ensures that, for a given amount of canvass and force of wind, the vessel should not incline beyond a certain angle. It is usual for vessels of war to calculate that moment for an angle of 7° or 9°, and then to provide that the ratio of that moment to the area of sail should lie within fixed limits, which have been practically found to be the best, varying with the different classes of ships.

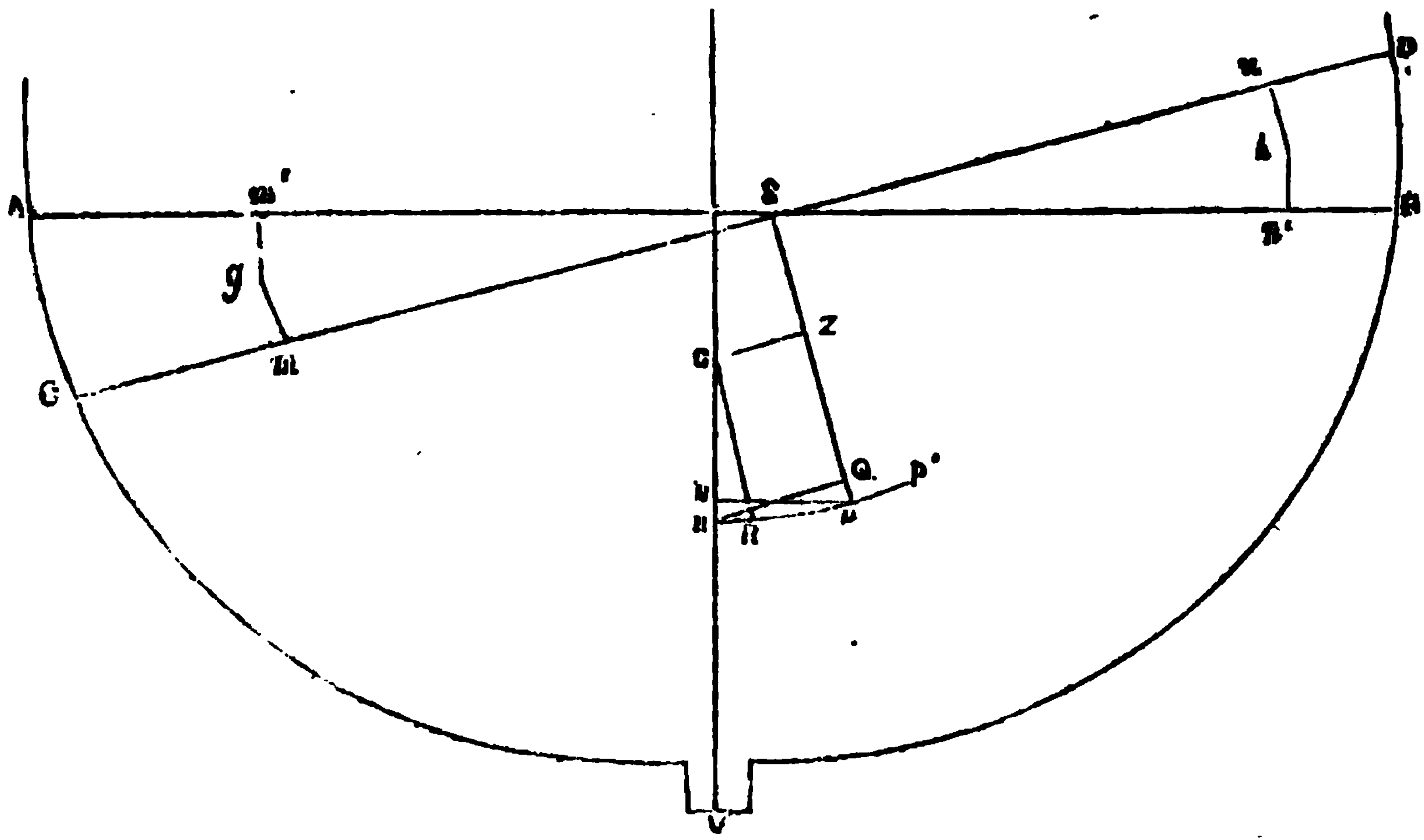
Both of these measures of stability may be made to depend on the determination of the rectangular co-ordinates of the centre gravity of displacement corresponding to the extreme inclination of the ship. If a ship were of a geometrical figure, the locus of these centres might be geometrically determined and laid down, and used as the basis of our calculations. The ship's surface is, however, generally of an irregular form, and the method for finding this locus approximately, at the same time gives the calculations we require for the stability. Thus, in fig. (1), let AVB be a transverse section of the ship (made by a plane perpendicular to the fore and aft line) containing the centre of gravity of the ship (G) and centre of gravity of displacement (H). And let AB be the section of the load-water line—that is, the line in which the plane of flotation when the vessel is upright cuts the ship. Suppose, now, the vessel inclined in the vertical plane ABD, through angle $ASC = \theta$, and let CSD be the inclined water-line, and P the corresponding centre of gravity of displacement, or rather its projection on AVB; g the centre of gravity of the volume contained between the water-lines AS, SC and the ship's side, which is carried out by the inclination, to which we will, following Dr. Inman's nomenclature, give the name of *out*; and h that of the corresponding volume which is carried under, and which we call the *in*; mg, nh perpendiculars on CD; PZ also a perpendicular from P

on CD; HQ, GZ, perpendiculars on PZ, and therefore parallel to CD; GR parallel to PZ, meeting HQ in R. Let $M\theta$ be the moment of the force that acts to bring the vessel back to the upright position—that is, its statical stability.

And $N\theta$ the number of units of work which have been done on the vessel during the inclination through the angle θ—that is, its dynamical stability.

In the inclined position CD is horizontal; and, since the vessel is acted

Fig. 1.



on only by its weight and the fluid pressure, which equals the weight of vessel, and acts upward vertically through the centre of gravity of displacement;

$M\theta$ = moment of force to restore the vessel to its position.

= W.GZ (W being weight of ship).

= W. HQ − W,HR = W. HQ − W. GH sin. θ . . . . . (1) And

$N\theta$ = Work done by gravity and fluid pressure during the inclination.

= Work done in producing the total *vertical* separation of the centres of gravity of ship and displacement.

= W (PZ − GH).

= W. PQ − W.GH + W.QZ.

= W.PQ − W.GH Vers. θ . . . (2).

Now, if PN be drawn perpendicular on VHG, it is easily seen that

HQ = PN cos. θ + HN sin. θ

PQ = PN sin. θ − HN cos. θ;

and therefore

W.HQ = W.PN. cos. θ + W.HN sin. θ

W.PQ = W.PN sin. θ − W. HN cos. θ.

Hence we see that all the calculations can be made to depend on finding the values of W.PN and W.HN.

Let w = the weight of the fluid displaced by the *in* or *out* (since they must be equal).

Draw $m'g$, $n'h$, perpendicular from g and h on AB.

Then by a well-known property of the centre of gravity,

$$w.m'n' = W.PN \quad . \quad . \quad . \quad (A)$$

$$w.(m'g + n'h) = W.HN. \quad (B)$$

The centre of displacement does not necessarily lie in the plane AVB. Suppose, then, that a and a' are the distances of centres of gravity of *out* and *in* from plane AVB, and x be the distance of centre of gravity of displacement P from the same plane.

Then

$$Wx = w(a' - a) = wa' - wa \quad . \quad . \quad (C).$$

This calculation it is as essential to make as the two former, because the centre of gravity of displacement ought not to travel much, if at all, out of the vertical plane AVB; for if it does, the axis about which the

vessel moves would be continually changing its direction, and a very complicated and disagreeable motion would result.

If a and a' have different signs; that is, if the centres of gravity of the *in* and *out* travel one towards the stem and the other towards the stern, it is evidently impossible to make x vanish; and, under these circumstances, it would attain its greatest value. But if they travel in the same direction; that is, both towards the stem or both towards the stern, $a'-a$ may be made very small, and even vanish. This it should be the aim of the naval architect to effect.

The advantages of a general uniformity in the calculations, used in naval architecture, are so obvious that it is unnecessary further to dilate on them. In the case of statical stability, Dr. Inman proposed a method by drawing radii from S (the intersection of the planes of flotation) to the ship's sides, which compensated by its simplicity for its want of uniformity with the other rules. This is only applicable, however, to comparatively small angles of inclination. To extend it to more than three radii, which considerable angles would require, would be tedious and complicated.

Attwood proposed in each case to measure ordinates parallel and perpendicular to CD, the inclined water-line for the whole ship, and apply the very same rules as for the upright position of the ship. This is evidently tedious. The method now proposed consists in taking the original load-water line AB, as the basis of all calculations, and performing them with as little departure as possible from the common rule.

In this portion of Dr. Woolley's paper, he has investigated the principles upon which the calculations for every vessel should be founded. The other part, which we intend to give in our next Number, exhibits the manner in which they are to be applied in any proposed case, and lays down a practical rule which is easily followed, though the several elements to be ascertained are certainly numerous, and must be cautiously dealt with.

EXCLUSION OF COLONIAL PATENT-RIGHTS.

The recent decision of the Patent-law Commissioners, by which the Colonies are excluded from patents, is alike incomprehensible in itself as a matter of policy, and irreconcileable with the public functions of these officers. Upon what principles they can have determined that the abolition of colonial patents would tend to promote the benefit of the Colonies themselves, or of the mother country, or that it was a step taken in strict conformity with the great object they were constituted to advance—the encouragement of useful invention and of inventors—we are utterly at a loss to conceive. As far as it goes, the alteration is decidedly a retrogression, and is certain to be felt as an intolerable limitation of the energies of the ingenious. If this arbitrary, and—we may well be excused for saying—this absurd settlement of the question of colonial patents, be allowed to remain upon its present footing, one great field of invention is at once swept away. Henceforth there will be no inducement for attempting the improvement of any of those numerous branches of colonial industry which contribute so largely to the wealth of our country, and administer to the wants and luxuries of its population: and, while inventors are thus deprived of a tempting and legitimate stimulus, colonial interests, and ultimately those of our own community, must inevitably suffer.

A measure so obviously contrary to the promptings of public expediency, and of justice to individuals, induces us to look into the causes which have probably occasioned it. If the noble and learned Commissioners who are the authors of this new and vicious principle had only looked around them before committing themselves to it, they would certainly have been struck with the anomaly they were about to introduce into our system of jurisprudence. There is no right more sacred, which principles of

natural justice recognize, than the rights of discovery and of invention. Amongst the most barbarous and uncultivated nations of the earth, there is not one which does not concede to discovery its claim to possession; and in civilized countries the preliminary steps should be few, simple, and accessible to the most humble, to secure the right when the groundwork of claim has been fully and satisfactorily made out. Indeed, it is only to the circumstance that, in a long course of time, a mass of unjust and impolitic obstruction had clogged the legal machinery of granting monopolies for invention, that the existence of the Commission itself is to be attributed. Considering that their great principle of action should be to smooth the rugged path of the inventor, and to facilitate the acquisition by him of a beneficial interest in his undertakings, we cannot but consider that they have, to say the least of it, most strangely lost sight of their duty.

To take even the limited view of the subject which would occur to most lawyers, in their capacity of a public body appointed to promote the reform of that branch of the law which they immediately administer, they might at least have proceeded upon the principle which is now directing the great work of the general amendment of the law. When they saw all law reformers around them busy in endeavouring to assimilate the law on one subject to that which prevailed on other collateral subjects which had been found to work well, it might certainly have occurred to them—and we are inclined to think it did—to consider the state of the law of copyright. No one questions the justice or the propriety of extending to our Colonies the right which an author possesses in his book; and experience shows that, while it protects the author, and so encourages the cultivation of literature, its operation has not been attended with any incidental inconvenience or injustice of a public nature to call for its abolition. Here, then, is an example exactly analogous in its circumstances to the matter with which these Commissioners were dealing, and which they have practically repudiated. Whether they have done so ignorantly or designedly, is a matter of little moment in the presence of the great mischief which they have created.

And what ground for this decision can be gathered from the history of our relation with the Colonies, so far as it depends upon the consequences of English invention applicable to their natural resources? Has English invention done nothing to originate and maintain vitality in colonial industry, that it should be thus abruptly shut out; or is it a matter of such perfect indifference whether it should continue to exist or not, for this particular field, that it is as well to put an end to it at once? A few examples, out of very many that might be adduced upon this point, will serve to show how completely the claim of inventors to be treated, if not with indulgence, at least with justice, has been disregarded. It is to the improvements introduced into various branches of the sugar manufacture, by a long succession of English inventions, that the West India Islands—reduced as may be their condition from the operation of political causes—owe a very large measure of the advantages they are in possession of. Howard's vacuum-pan, and Alliott, Finzel, and Co.'s centrifugal machine, were there no other instances of benefit to the Colonies from English invention, might alone have sufficed to obtain from these high functionaries respect for the principle, at least, of the late system.

To come to recent examples; had the law been vitiated at an earlier date, New Zealand would never have experienced the benefit of the vast scope for its industry opened up for it by the process of Mr. Stenson for converting its iron-sand into merchantable bars, available at once for all the great purposes which machinery develops and organizes. Last of all, too, and as if for the purpose of checking the flood of wealth unexpectedly brought to our shores from the great Australian matrix, this unjust decision is to prevent entirely the efforts of the ingenious to facilitate the acquisition of the precious metal, by introducing improved means of washing, separating, crushing, amalgamating, and generally treating it.

It is not as regards the Colonies alone that this new arrangement is impolitic.

In our rivalry with other European countries, and with America, it cannot fail of proving the most short-sighted policy imaginable. For the future, no sooner will our engineers and our chemists have devised any improvements in colonial processes, than the colonists will avail themselves of French and Belgian manufacturers, because they will then escape the payment of royalty, and get their machinery from foreign engineers free of patent right. Thus an important part of English machine-making is about to be transferred to other countries, and lost to our own.

The measure is, in point of fact, a voluntary abandonment of our Colonies, so prolific in their incentives to invention, to the ingenuity of foreign inventors, who, we may depend upon it, will not be slow to perceive and take advantage of our folly.

In the presence of so unjust and foolish a decision having the force of law, and inflicting so terrible a blow on the inventor for the Colonies, who has all along been calculating upon his power of taking out a colonial patent, we have not even the satisfaction of knowing precisely the ground upon which the subject rests. Lawyers are obviously the worst legislators a country can have. Men who have no higher aim for their talents than the discussion of minute questions of legal construction, are not the men to appreciate the great questions which constantly arise in the social organization of a great people. This country, of all others, cannot be successfully governed by such means, and we need look no further for an assurance on this point than to the subject before us, which, if we understand it rightly, has not received the unanimous approval of the Commission. We have reason to believe that the Attorney-General, Sir Frederick Thesiger, and the Solicitor-General, Sir Fitzroy Kelly, were both opposed to the exclusion of the Colonies, but that the Lord-Chancellor and the Master of the Rolls being in favour of it, it took the form and the incidents of a decision. In whatever way it has been done, however, and whatever may be the precise scope of the decision, the effect is clear and unmistakeable. Patents can no longer be secured in the Colonies. So far from the rights of the matter being understood, it has been managed in so slovenly a way, that all we can learn about it is, that the joint wisdom of the Colonial-office and of the Board of Trade has been at work here. Their production is well worthy of their fame. They have contrived—let us hope only for a time—to inflict a great injustice on individuals, and to damage the prosperity of the empire in one of its cardinal points. For the present we must be content to bow to the "decision;" but we should be wrong not to look forward to a prompt and efficient adjustment of the subject at the hands of the Legislature.

EXHIBITION OF RECENT INVENTIONS AT THE SOCIETY OF ARTS.

In the section of manufacturing machines and tools, Sullivan's Dandy-roller excited considerable attention. The novelty of the design consists in the longitudinal bars, with slots for the wire to fall into, instead of being sewn as hitherto, thereby giving a uniform surface to the roller, and preventing ridges.

Mr. J. H. Johnson exhibits a drawing of Gathercole's Envelope-machine, which executes the several processes of gumming, carrying the creasing-table, embossing, creasing, and discharging, for the complete poduction of the envelopes from the plain flat blanks.

E. Lyon's machine for mincing meat is worthy of notice, from its simplicity and extreme compactness. It only occupies a space of 14 inches square, and may be screwed to a counter or kitchen dresser. The interior is fitted with a cylinder, pricked like an organ-barrel. When set in motion by a handle, which also works a multiplying wheel, the jutting pins pass a series of vertical knives, which in an instant reduce the meat in the feeder to shreds of the smallest size. The machine is stated to work without noise.

Urwin's Pump was exhibited by Messrs. Burgess and Key.

Shaw's Fruit-Dressing Machine gives a reciprocating motion to a sifter, by an ordinary crank, worked by a wheel and pinion. Its purpose, and that also of Mr. Buck's currant-dressing machine is the disintegrating, cleansing, and separating the stones, dust, and other matter from currants, as they are delivered to the merchant from Zante and Smyrna.

Starkey's Gold-Washing Machine has four blades, or fans, working in a cylindrical vessel of galvanized iron, which throw water against a sieve placed in the vessel, on which the ores to be washed are laid. The blades are set in motion by a handle, the action being regulated by a fly-wheel. At each revolution a jerking motion is given to the sieve, which facilitates the separation of the gold from other substances. The auriferous matter falls through the sieve to the bottom of the cylindrical vessel, from which it escapes into a receiver beneath, where it undergoes a second washing.

Barnes's Barrow Gold-Washing Machine.—This machine consists of a strong wooden trough for holding the water, mounted on legs and wheels, and forming a barrow for convenience of transport. A strong cylindrical galvanized iron wire cage, with shaft and radial arms, for breaking the earth, is placed in the trough. The rotary motion is given to the cylinder by means of a winch-handle and cog-wheels. The nuggets of gold and stones are retained, the gold-dust and fine particles passing through into a fine wire sieve in the bottom of the machine.

Richards and Co.'s Gold-Washing Cradle.—This consists of a galvanized iron sieve, into which the auriferous soil is thrown. Water is then poured into the sieve, and the machine being rocked, the stuff is washed through to the distributing-table, and so along the bottom of the machine. The bottom machine is divided by three transverse stops, which arrest the heavy particles of gold, and allow the lighter earthy matter to be washed away by the flow of water. The particles of gold collected by the stops are then washed through the three plug-holes in the bottom of the machine, and afterwards dried and sifted.

Lyon's Gold-Washing Machine, exhibited by T. F. Griffiths, combines in itself a cradle washing-machine, and detective apparatus, and can be used with or without water, by placing a little quicksilver in the cavity at the bottom, which will collect every grain of gold. From its lightness, a lateral or circular motion can be given with but little exertion.

A Pickaxe for Gold-diggers, by H. Thomas.—This is a very ingenious and useful implement. It is constructed with a groove, into which differently-shaped points can be fitted; and when one end of a point is worn away, the other can be substituted.

Lee's Combination Gold-digging Tool consists of a steel shovel, with a loose handle, adapted to fit all the tools. The shovel may be altered so as to be used as a pick and a scraper. To the handle a crowbar can be fitted, and also an axe with a pointed hammer, which can be used for breaking granite.

Miner's Lamps, by E. Simons.—Several modifications of this lamp are shown, some for hanging in the mine, others with a spear attached, enabling them to be stuck into the ground. [Similar to, if not identical with, Biram's Lamp, described in Vol. li., p. 217.]

Watson's Miner's Safety-lamp is a modification of Sir Humphrey Davy's. The improvement consists in the form and better arrangement of the parts, so that the miner cannot open the lamp, or get access to the flame, which has been the chief cause of the serious explosions that have taken place.

M. Eloin's Miner's Safety-lamp, exhibited by J. Thornton and Sons. In these lamps the flame is surrounded with a short thick glass, well protected, and the air is admitted through wire gauze below the flame, and under a cover or cap, on the principle of the solar lamp. A much better light is thus produced, and perfect combustion obtained. All danger from over-heating of the gauze, accumulation of soot and coal-dust, is removed; and the combustion-chamber of glass being bound at the top and bottom by a strong brass ring, any accident by the cracking of the glass from unequal expansion is prevented.

Austin's Bricks for the Formation of Hollow Walls. — The advantages claimed for these bricks are increased strength, and opportunities by "infill" spaces, for the escape of damp in thick walls, and for admitting the passage of a current of air vertically. The bricks are dowel-shaped, so that a strong bond is obtained.

Mr. Hartley exhibits some fine specimens of rolled glass. This glass is semi-opaque, and being produced in large sheets, can be advantageously used in place of the small panes with metal framework in Gothic and other structures.

Hesketh's Combination Reflectors; manufactured by Boyd and Chapman.—This invention consists of a series of narrow reflectors, capable of every adjustment to any angle, so as not to project in an inconvenient and unsightly manner outside or inside of a window. The reflecting surfaces are brought up to the opening, so that all parts of the room are lighted. The reflectors are capable of any adjustment, and being in narrow widths, are cheaper than those ordinarily used. The glass is silvered chemically with pure silver, and protected from the action of the air by painting.

The following novelties are exhibited in stones:

Phillips's Hot-water Stove.—The leading feature in this stove is the large heating surface exposed to the action of the fire,

by which means a smaller quantity of fuel is necessary than in other stoves.

Goddard's Asbestos Gas-stove.—The advantage of this over other gas-stoves is, that while a large amount of heat is radiated, a cheerful incandescent fire is presented to the eye. It is also compact and portable.

Blashfield's Gas-stove.—The case of this stove is constructed entirely of terra cotta. The gas-burner is placed below a hollow cone of fire-brick, which serves to give warmth to the apartment at the same time that it prevents the emission of noxious vapours.

Hicks's Charcoal-stove.—This stove renders the use of charcoal harmless, gives out a great amount of heat, and requires little attention.

[A beautiful model of boat-lowering apparatus has been sent by Mr. W. S. Lacon, which exhibits the several methods at present practised for the stowage and lowering of boats, and also some practical suggestions for further facilitating this object.]

Mr. Bridson also has a model for the same purpose, by which a boat may be lowered without risk by the most inexperienced person.

A Deviation Compass; by Captain W. Walker, R.N.—The object of this invention is to obviate or neutralise the defects in the existing compass, and to produce an instrument capable of indicating the course of a vessel with correctness, both in fair and in foul weather, in all localities, and when under agitation from external or internal causes, so that the deviations and errors of the mariner's compass may, when necessary, be ascertained and indicated. (See *Mec. Mag.*, Vol. lvii. p. 161.)

There are several specimens of bullet-moulds, beautifully made. One, by Mr. Palmer, is intended for casting hollow conical balls or projectiles.

Another, by Mr. Beckwith, is made of two parts only, and by placing the run at the side, the points of the bullet are perfected. It also admits of steel points being cast upon the bullets for sporting purposes.

Mr. J. T. Campion also exhibits one for casting hollow conical balls. In this mould, the core which forms the hollow of the bullet is attached to the joint. When opened half way between the two cheeks, the bullet is freed from the chamber, and on being reversed falls from the core.

Maling's Rifle-barrel and Balls.—These are models illustrative of a rifle-barrel, a rifle motion, and the methods of obtaining it. The object is accomplished by assisting or wholly communicating the rotation by means of a leather wad, for preventing windage, without any injurious amount of friction. Specimens of rifle and cannon balls, having iron cores or centre-pieces, are also exhibited.

Solid Self-expanding Projectiles; by H. Wilkinson.—The hind-part of this bullet being lighter, and having less strength to resist the shock than the fore-part, closes up and expands before it can overcome the inertia of the heavier mass of lead in front (which is the cylindro-ogivale portion), and thus expands and fills the grooves of the rifle, so as to stop all windage passage instantly, and by receiving the impression of the grooves, it acquires the rotation necessary to secure accuracy of flight.

[In our next we shall proceed to notice the philosophical instruments, and the remaining portions of the Exhibition.]

STATISTICS OF THE RECENT RAINS.

(From the *Liverpool Albion*.)

The last seven months of the past year will, we believe, prove to be the seven wettest consecutive months on record. From the beginning of June up to beyond the middle of October we had copious rains, varied only by intervals of fine weather. From the latter part of October, throughout the whole of November, and far into December, we have had perpetual, thick, persevering rain. All over England and Ireland this visitation of rain has been equally excessive. "The recent floods," as remarked by a metropolitan contemporary, "are unprecedented in the memory of the present generation. Disastrous inundations from sudden thaws are of frequent occurrence in particular localities. These, however, depend more upon a rapid change of temperature than upon any extraordinary fall of snow or rain extending over a long period. But the floods of which we have heard so much within the last month, from all parts of the country, are to be entirely attributed to the actual quantity of rain that has been falling within the last six months."

The observations made in the vicinity of Dublin correspond very nearly with those made near London. At Dublin, during twenty-six days in November last, there fell 6¼ inches of rain, which was one-fourth of the annual average depth that falls in the district. On the 11th of the month there fell 1½ inch; on the 12th, a quarter of an inch; on the 13th, half an inch; and on the 14th, three quarters of an inch; making a depth of 3 inches in four days. From the observations made near London, it appears there fell in the same four days upwards of 2¼ inches. The total amount which fell at

London in November last was 6·20 inches, or 6¼ inches, which, deducting seven days on which no rain fell, gives nearly 6¼ inches in twenty-three days. The average amount of rain in the vicinity of London in the November months for the last twenty-six years is 2·16 inches; the greatest November fall having been in 1842, when it was 4·47 inches; and the least in 1851, when it was little more than half an inch. We learn from the *Gardeners' Chronicle*, that "so much rain has not fallen near London in November, nor in any one month, with the exception of July, 1834, for at least fifty-five years." The amount which fell in July, 1834, was 6·34 inches. In November, 1798, there fell, at London, 4·27 inches; and in 1800, 1804, 1810, and 1821, respectively, 5·32, 5·59, 5·32, and 4·67 inches. For the following account of the depth of rain which fell near London in November last, we are indebted to the paper just quoted:

	In. Pts.		In. Pts.
Nov. 1 . . .	0·02	Nov. 16 . . .	0·12
„ 2 . . .	0·61	„ 17 . . .	0·11
„ 3 . . .	0·16	„ 18 . . .	—
„ 4 . . .	0·01	„ 19 . . .	0·24
„ 5 . . .	0·05	„ 20 . . .	0·35
„ 6 . . .	0·05	„ 21 . . .	0·10
„ 7 . . .	0·15	„ 22 . . .	0·04
„ 8 . . .	—	„ 23 . . .	0·18
„ 9 . . .	—	„ 24 . . .	—
„ 10 . . .	0·06	„ 25 . . .	0·22
„ 11 . . .	1·02	„ 26 . . .	0·70
„ 12 . . .	0·13	„ 27 . . .	—
„ 13 . . .	0·22	„ 28 . . .	0·08
„ 14 . . .	1·24	„ 29 . . .	—
„ 15 . . .	0·34	„ 30 . . .	—
	4·06		2·14

The copious rain has not, however, been confined this year to one month, as was the case in the year 1834, when there was so great a fall in July. Great quantities fell in the months preceding November, the amounts of which we shall hereafter show; and the superabundant supplies of moisture have continued far into December. No doubt, from the 1st of November last till the present time, fully 8 inches of rain have fallen, which is nearly half the quantity which descended during the whole of 1847, when the total amount for the year was only 16·65. In 1850, the amount for the year was 18·28, and last year, 20·79, the annual average fall being about 24 inches; so that the depth during the last seven weeks has been equal to one-third the average of ordinary years.

The total fall of rain this year at London, up to the end of November, was, notwithstanding the dryness of the early months, 30·67 inches. The following is the record, extracted from the source before acknowledged:—January, 2·72; February, 1·06; March, 0·25; April, 0·52; May, 1,74; June, 4·69; July, 2·27; August, 3·71; September, 3·64; October, 3·87; November, 6·20 inches—Total, 30·67. The greatest fall in the course of the twenty-six years preceding was in 1841, when the depth was 30·97 inches; the smallest in 1847, when the depth was 16·65 inches; the average being, as we have stated, 24 inches. Adding to the ascertained fall for the present year 2½ inches, which is not excessive, considering the almost incessant rain we have already had last month, we have as the total fall in 1852, 33·17 inches. Of this there fell in the six months from the beginning of June to the end of November, 24·38 inches. If we add 2½ inches for December, we have nearly 27 inches, or an excess in seven months of 3 inches over the mean annual average.

MR. STEWART'S PHOTOGRAPHIC PROCESSES.

The following letter from Mr. John Stewart, the brother-in-law of Mr. J. F. W. Herschel, and now resident at Pau in the south of France, contains the details of the photographic processes employed by him in taking landscapes; and will, on that account, be highly prized by every amateur in that elegant art. Its value will be seen from the terms in which Mr. Herschel speaks of the successful phtographic manipulation of his ingenious relative. The letter was sent to Mr. Herschel; and referring to photography and its cultivators, Mr. Herschel speaks of Mr. Stewart as one "who has been singularly successful in his application of that art to the depiction of natural scenery; and whose representations of the superb combinations of rock, mountain, forest, and water which abound in the picturesque region of the Pyrenees are among the most exquisite in their finish, and artistic in their general effect, of any specimen of that art which I have yet seen. The extreme simplicity of the process employed by him for the preparation of the paper, its uniformity, and the certainty attained in the production of its results, seem to render it well worthy of being generally known to travellers. It need hardly be mentioned that the 'air-pump' employed may be one of so simple a construction as to add very little to either the weight, bulk, or expense of the apparatus required for the practice of this art. The obtaining of a very perfect vacuum, for the imbibition of the paper, being a matter of little moment — a single barrel (worked by a cross-handle by direct pull

and push), furnished with a flexible connecting-pipe, and constructed so as to be capable of being clamped on the edge of a table, would satisfy every condition."

The following is a copy of the letter:

"My dear Herschel,—Thanks to the valuable indications of Professor Regnault, of the Institut, I have been enabled to produce, what appear to me, most satisfactory results in photographic landscapes on paper. In this remote corner (so deficient also in resources for experiment) I fell that I am but very partially acquainted with the results obtained, and the progress making in the great centres, Paris and London; but I think that, in detailing the simple process and manipulation I now adopt, indications of some value, and suggestive of further improvement to fellow-labourers in the art may be found; and if you are of the same opinion, you will, perhaps, facilitate the communication of these details to our photographers at home."

The following observations are confined to negative paper processes, divisible into two—the Wet and the Dry. The solutions I employ for both these processes are identical, and are as follows:

Solution of iodide of potassium, of the strength of five parts of iodide to 100 of pure water.

Solution of aceto-nitrate of silver, in the following proportions: 15 parts of nitrate of silver; 20 of glacial acetic acid; 150 of distilled water.

Solution of gallic acid, for developing, a saturated solution.

Solution of hyposulphite of soda; of the strength of one part hyposulphite of soda to from six to eight parts water.

The solutions employed are thus reduced to their simplest possible expression, for it will be observed that in iodizing I employ neither rice-water, sugar of milk, fluorine, cyanure, nor free iodide, &c.; but a simple solution of iodide of potassium (the strength of this solution is a question of considerable importance, not yet, I think, sufficiently investigated).

For both the wet and the dry processes, I iodize my paper as follows. In a tray containing the above solution, I plunge, one by one, as many sheets of paper (twenty, thirty, fifty, &c.,) as are likely to be required for some time. This is done in two or three minutes. I then roll up loosely the whole bundle of sheets, while in the bath; and picking up the roll by the ends, drop it into a cylindrical glass vessel with a foot to it, and pour the solution therein, enough to cover the roll completely (in case it should float up above the surface of the solution, a little piece of glass may be pushed down to rest across the roll of paper and prevent its rising). The vessel with the roll of paper is placed under the receiver of an air-pump, and the air exhausted; this is accomplished in a very few minutes, and the paper may then be left five or six minutes in the vacuum. Should the glass be too high (the paper being in large sheets) to be inserted under a pneumatic pump-receiver, a stiff lid lined with India-rubber, with a valve in the centre communicating by a tube with a common direct-action air-pump may be employed with equal success. After the paper is thus soaked in vacuo, it is removed, and the roll dropped back into the tray with the solution, and then sheet by sheet picked off and hung up to dry, when, as with all other iodized paper, it will keep for an indefinite time.

I cannot say that I fully understand the *rationale* of the action of the air-pump, but several valuable advantages are obtained by its use:—1st. The paper is thoroughly iodized, and with an equality throughout that no amount of soaking procures, for no two sheets of paper are alike, or even one perfect throughout in texture; and air bulbs are impossible. 2nd. The operation is accomplished in a quarter of an hour, which generally employs one, two, or more hours. 3rd. To this do I chiefly attribute the fact that my paper is never solarized even in the brightest sun; and that it will bear whatever amount of exposure is necessary for the deepest and most impenetrable shadows in the view, without injury to the bright lights.

Wet Process.—To begin with the wet process. Having prepared the above solution of aceto-nitrate of silver, float a sheet of the iodized paper upon the surface of this sensitive bath, leaving it there for about ten minutes. During this interval, having placed the glass or slate of your slider quite level, dip a sheet of thick clean white printing (unsized) paper in water, and lay it on the glass or slate as a wet lining to receive the sensitive sheet. An expert manipulator may then, removing the sensitive sheet from the bath, extend it (sensitive side uppermost) on this wet paper lining, without allowing any air globules to intervene. But it is difficult, and a very simple and most effectual mode of avoiding air globules, particularly in handling very large sheets, is as follows:—Pour a thin layer of water (just sufficient not to flow over the sides) upon the lining paper, after you have extended it on your glass or slate, and then lay down your sensitive paper gently and by degrees, and floating as it were on this layer of water; and when extended, taking the glass and papers between the finger and thumb, by an upper corner, to prevent their slipping, tilt it gently to allow the inter-

posed water to flow off by the bottom, which will leave the two sheets of paper adhering perfectly and closely, without the slightest chance of air-bubbles; it may then be left for a minute or two, standing upright in the same position, to allow every drop of water to escape; so that when laid flat again, or placed in the slider, none may return back and stain the paper. Of course, the sensitive side of the sheet is thus left exposed to the uninterrupted action of the lens, no protecting plate of glass being interposed—and even in this dry and warm climate, I find the humidity and the attendant sensitiveness fully preserved for a couple of hours.

To develope views thus taken, the ordinary saturated solution of gallic acid is employed, never requiring the addition of nitrate of silver; thus preserving the perfect purity and varied modulation of the tints. The fixing is accomplished as usual with hyposulphite of soda, and the negative finally waxed.

Dry Process.—In preparing sheets for use when dry, for travelling, &c., I have discarded the use of previously waxed paper—thus getting rid of a troublesome operation—and proceed as follows:—Taking a sheet of my iodized paper, in place of floating it (as for the wet process) on the sensitive bath, I plunge it fairly into the bath, where it is left to soak for five or six minutes; then, removing it, wash it for about twenty minutes in a bath, or even two, of distilled water to remove the excess of nitrate of silver, and then hang it up to dry, in lieu of drying it with blotting-paper. Paper thus prepared possesses a greater degree of sensitiveness than waxed paper, and preserves its sensitiveness, not so long as waxed paper, but sufficiently long for all practical purposes, say thirty hours, and even more. The English manufactured paper is far superior for this purpose to the French. To develope these views, a few drops of the solution of nitrate of silver are required in the gallic-acid bath. They are then finally fixed and waxed as usual.

These processes appear to me to be reduced to nearly as great a degree of simplicity as possible. I am never troubled with stains or spots, and there is a regularity and certainty in the results that are very satisfactory. You will have observed, too, how perfectly the aërial perspective and gradation of tints are preserved; as also how well the deepest shadows are penetrated and developed—speaking, in fact, as they do to the eye itself in Nature. In exposing for landscape, I throw aside all consideration of the bright lights, and limit the time with reference entirely to the dark and feebly-lighted parts of the view; with a 3½-inch lens, the time of exposure has thus varied from ten minutes to an hour and a half, and the action appears to me never to have ceased.

The influence of the air-pump in this appears to me to be very sensible, and deserving of further examination and extension. I purpose not only iodizing, but rendering the paper sensitive with the action of the air-pump, by perhaps suspending the sheet after immersion in the nitrate bath under the receiver of the air-pump for a few minutes, before exposure in the camera, or by some other manœuvre having the same object in view.

I should add, that I have chiefly employed Canson's French paper in iodizing with the aid of the pump. Few of the English manufactured papers are sufficiently tenacious in their sizing to resist the action of the pump, but they may easily be made so; and were, in short, the English paper, so far superior in quality to the French, only better sized, that is with glue less easily soluble, even though more impure, there is scarcely any limit to the beauty of the views that might be produced.

There are more minor details than might be given; but I fear repeating many a "twice-told tale," acquainted so little as I am with what is doing; the preceding, however, may have some interest, and whatever is of value is entirely to due to our friend M. Regnault, ever so generously ready, as well as able, to aid and encourage one's efforts.

JOHN STEWART.

THE DUBLIN EXHIBITION.

THE arrangements for this great coming event are progressing most satisfactorily, and promise that it will pass off with great *éclat*.

Mr. Deane, the colleague of Mr. Roney in the secretaryship of the undertaking, has lately visited Birmingham and its neighbourhood, and obtained promises of support far beyond his expectations. Messrs. Elkington and Co. are preparing a choice assortment of their goods, and their compartment at the Exhibition will be one of considerable attraction. Since the Great Exhibition of 1851, many new and chaste designs in electro-plated work have been made, and some articles remarkable for their costliness and superior workmanship, and now making for distinguished individuals, will doubtless be added to the collection. Messrs. Winfield will exhibit their ornamental brassworks, including chandeliers, lamps, gas-fittings, and bedsteads; and

Mr. Potts, of Easy-row, is preparing a selection, which will be found worthy of the Exhibition, and the high reputation of his own establishment. Messrs. Hardman and Co. are preparing a quantity of ecclesiastical metal work; and, judging from their display made in the mediæval court of the Great Exhibition, this firm will contribute a magnificent selection of richly-finished articles, designed by Mr. E. Pugin, son of the late distinguished architect. Messrs. Hardman and Co. will also exhibit some fine specimens of stained glass, intended for church decorations. Mr. W. Richards will forward a quantity of guns and pistols, of superior manufacture; and Messrs. Chance, of Spon-lane, will contribute specimens of their manufacture in glass. Messrs. Jennings and Bettridge are preparing articles of *papier maché*, richly ornamented with mother of pearl and gold. Messrs. Richardson, Davis, Greathead, Gillot, Sheldon, and many other leading manufacturers, are also actively engaged in preparing goods for the Exhibition.

THE TRADES OF BIRMINGHAM.

The flint-glass trade is now extremely active. The masters and men are taxed to their fullest powers, and it is with difficulty the orders on hand can be executed at the works of Messrs. Rice, Harris, and Son, Messrs. Bacchus's, Mr. Walsh, and others. Messrs. R. Harris and Son are represented to be full of orders; and in this, as well as in other houses of the town, great difficulty has been experienced in supplying demands for immediate use. The trade was never known to be better at this period of the year.

In the metal trades, the new style of ornamentation introduced and patented by Mr. R. F. Sturges, of Broad-street, which, for simplicity and economy, is unsurpassed, has attracted a good deal of notice during the past week. It has hitherto been customary to adorn plain surfaces by means of engraving, which method, as will be readily understood, is an expensive one, owing to the time consumed and wages paid to the workmen employed thereon. The new method devised and patented by Mr. Sturges consists in laying between two or more plates of metal pieces of wire web, thread, or other lace, or paper perforated or cut into various forms or devices; the two sheets of metal with the pattern between, being passed through a pair of metal rolls, will be found after the operation to leave the impression of the wire, lace, or paper marked on their surface in depth corresponding to the softness of the metal upon which the impression is desired. Thus on nickel, silver, and brass, as will be readily understood, the depth of the impression is somewhat less than upon Britannia metal. Already several articles formed of this material, and thus ornamented, have been produced, and with complete success. The metal in the sheet may be manipulated by the ordinary process employed in the electro and Britannia metal trades. Delicacy and correctness of outline, in connection with the most exquisite surface ornament, demonstrate the value of the invention as applied to articles of every-day use and sale. The proprietor of the patent, Mr. Winfield, of Cambridge-street Rolling Mills and Works, manufactures the metal for consumers, and is also about to apply it to the various branches of the brass-foundry trade, tubes, pillars, metallic bedsteads &c. No doubt exists in the minds of those who have witnessed the operation and effects of the invention, that it will be productive of much benefit, principally in reference to the economic production of articles for domestic purposes of better-class style than has hitherto been produced at the same cost.

The greatest activity still prevails in the brass foundry trade, and notwithstanding the exertions made to complete all orders previous to the conclusion of the quarter and the end of the year, many still remain on hand which it will be quite impossible to accomplish.

Excellent orders have been received during the present week from Australia. The articles chiefly required were for husbandry and digging purposes, and also for saddlers' ironmongery.

The state of the poor in the parishes of Birmingham and Aston continues favourable. The weekly reports of the Poor Law officers are satisfactory, and the operatives of all classes are in possession of more than an average amount of work.

In connection with the trade of this town, it is gratifying to notice the following circumstance. For some time past it has been in contemplation to extend the plan of allowing workmen a half day holiday on Saturday, as in some other towns, and within the last few days several of our principal manufacturers have consented to the proposition. At a numerous meeting of the men employed at the Cambridge-street Works, held on Tuesday evening last, the proprietor, R. W. Winfield, Esq., agreed, in accordance with a request previously made, to grant a half day holiday on Saturday for the future. The announcement was received with acclamation. At this gentleman's extensive works about 500 people are employed, to whom the concession just granted will be a great boon.

Messrs. Brown, Marshall, and Co., the

extensive railway carriage manufacturers, have also conceded to their numerous work-people the same privilege, and it is expected that other large houses will follow the example.

THE IRON TRADE.

Birmingham.—The iron trade of this district continues unprecedentedly active, and prices apparently have no limit. Foreign orders within these few days are said to have created an additional demand. Orders for hot blast mine pigs have been refused at *5l.* *10s.*, and bars, plates, and nailors' rods cannot be obtained except in a very limited quantity. There appears to be no doubt that, nominally, it will be subjected to a further advance at the preliminary meeting of ironmasters to be held during the ensuing week. In the meanwhile manufacturers are threatened with *15l.* and *16l.* per ton, and the number and unprecedented extent of the orders recently received are said to justify fully these extraordinary prices. It is quite true there are large orders on the books. One master has foreign orders, the execution of which will extend over the next two years, and he has also many embarrassing demands upon his furnaces for home consumption.

The member of an eminent firm in Glasgow, in a letter to a merchant in Birmingham, published in the *Birmingham Journal*, throws some light upon this extraordinary state of the iron market. He says—"The really actual increased demand for consumption at present for iron is not the reason for the sudden great rise in price, particularly in pigs. I have heard that the demand for plates and malleable irons, owing to the great increase in iron shipbuilding and the formation of the East Indian Railway, is greater than the present works for manufacturing iron into this state can produce; and, although I have no definite information as to this, I could suppose that very probable; but I have no hesitation in saying that the actual present produce of pig iron is greater than there is consumption for, and that the present great rise in price is mainly owing to the operations of speculators in London and Liverpool. The total number of furnaces now built and that can be thrown into operation in Scotland is 143. The actual number in blast and in full work on the 20th of November was 112. This is from the *data* in the possession of one of the first ironbrokers here. These furnaces are working on Saturday and Sunday—seven days in the week—and their produce is 20 tons each 24 hours, this being a low average of what they actually produce: therefore, supposing the number of furnaces at present in blast in Scotland to be 112 (I believe there are now more), their produce weekly is as follows:—112 furnaces, producing 20 tons each per day, is equal to 15,680 tons per week. The actual stocks of iron in Glasgow at this moment are enormous, although it is understood that most of these stocks are now sold to English speculators, and are at present held deliverable to their orders; but it is strange that, during October and November, the average amount of shipments of iron from Scotch ports was less than usual. The total quantity of iron shipped from the 1st of January, 1852, to the 31st of October last, was 384,200 tons, or very nearly 9,000 per week, while the average weekly shipments during October and November were very slightly over 8,000 per week. The stock of iron, therefore, in Scotland is supposed to be increasing at present at about 7,000 tons weekly. Connal and Co., the bankers here, have at present in their yards between 80,000 and 100,000 tons of pig iron, all of which is understood to be sold to English speculators. The fact, too, that the speculation in iron in Glasgow has been very small, shows that those who should know the iron trade pretty accurately have had no confidence in the rise in price. A highly-intelligent person, connected with the iron trade, told me to-day that he believed the fall in iron would be sudden and very great, and that it would be found that the large portion of the enormous stocks in Glasgow were held by English speculators." In these opinions many merchants of this neighbourhood coincide.

The writer of this letter, in support of his view of the present artificial state of the iron market, quotes the following broker's report, which had just come in, and which confirms partly what he has said, the cause of brokers being unable to sell for immediate delivery from stores here being occasioned by nearly the whole stocks being in the hands of English speculators:

"Glasgow, Dec. 18, 1852.

"Gentlemen,—We have to report a very decided advance in pig iron during the past week, several large orders having been given at unlimited rates, and there being few parties here prepared to sell iron in store; for immediate delivery *3s.* per ton advance was asked and paid. This demand is altogether from English speculators, as the trade here look at the stock in Scotland, which is on the increase, say of 6,000 to 8,000 tons a week; this, on account of the great scarcity of tonnage, our shipments, for some weeks past, being under an average.

"Yours obediently,

"JAS. WATSON, and Co."

Glasgow Pig Iron-Market.—Pig iron has been subject to considerable fluctuation in

price during the present week—77*s.* cash having been paid on Monday, while on Wednesday (a panic prevailing) sales were effected as low as 70*s.* Confidence has again been restored, and we close quietly, sellers, warrants at 75*s.*; buyers offering 74*s.*, cash.

America.—By the Royal Mail Steamship *Europa*, which arrived at Liverpool on Sunday with advices from New York to the 15th inst., we learn that the market for Scotch pig iron remained as before, but English bars had advanced.

California.—(Under date San Francisco, November 15, 1852). Boiler iron for shutters in great demand, which is likely to increase with the addition of brick buildings in various parts of the country.—*Times.*

Services of the South Shields' Lifeboats.—The invaluable services which these excellent lifeboats, with their gallant crews, have rendered during the late disastrous gales, have of late been frequently referred to in the columns of the *Times*, and the following is a list of the ships' crews they have rescued from a watery grave, between the 21st of September and the 20th of December, of the present year:—*Ninus*, of Jersey, six; *Providence*, of Falmouth, five; *William and Sally*, six; *Friends*, of Banff, four; *Abraham*, of Yarmouth, three; *John Wesley*, tide full, and crew landed on the rocks; *Unity*, of Lynn, six; *La Petite Marie*, from France, six; *Union*, of Wisbeach, six men and three women—nine; *Marie Elizabeth*, seven; *Dorothy*, of South Shields, seven; *Lively*, of Clay, five; *Eliza and Caroline*, eight; *Jane and Elizabeth*, of Shields (drove out with the fresh, and upset), one; *Penelope*, of Teignmouth, seven;—total, being all that were on board and brought safe on shore, eighty. The new lifeboats, on the design of Mr. Peake, assistant master shipwright in Her Majesty's Dockyard, Woolwich, which have lately been placed on various parts of the Northumberland coast, are also very highly spoken of, and have, from recent trials made with them, inspired the greatest confidence in their crews, as a lifeboat is almost useless if she does not possess the confidence of those who have to manage her. The necessity for good lifeboats has been severely felt during the last month, as upwards of 300 wrecks (the largest number in so short a period on record) have occurred on different parts of the coast in that period, involving, as usual on such occasions, a large sacrifice of human life.—*Times.*

New Green Dye.—M. Persoz has recently examined a new green dye received from China; it is perfectly distinct from indigo, though resembling it, and is evidently of vegetable origin; the colours dyed with it are brilliant, and remarkably permanent.—*Journal of the Society of Arts.*

A Problem Solved.—What to do with the refuse of our alkali works, has long been a perplexity. Not being an article of commerce, it was a "growing evil;" but Dr. Glover, we are told, has in some measure solved the difficulty. He saw that, if not of value as cargo,—if ships would not take it away in their holds,—it might be applied externally to their hulls. He has had it converted into a pigment for iron ships anti-corrosive, and repellant of barnacles and weeds. If the ingenious device should be found to answer, the doctor may be congratulated on having conferred a great boon on our chemical works and our shipping.—*Gateshead Observer,*

Declivity of Rivers.—A very slight declivity suffices to give the running motion to water. Three inches per mile in a smooth, straight channel, gives a velocity of about three miles an hour. The Ganges, which gathers the waters of the Himalaya Mountains, the loftiest in the world, is, at eighteen hundred miles from its mouth, only about eight hundred feet above the level of the sea; that is, about twice the height of St. Paul's Church in London, or the height of Arthur's Seat, near Edinburgh; and to fall these eight hundred feet, in its long course, the water requires more than a month. The great river Magdalena, in South America, running for a thousand miles between two ridges of the Andes, falls only five hundred feet in all that distance. Above the commencement of the thousand miles it is seen descending in rapids and cataracts from the mountains. The gigantic Rio de la Plate has so gentle a descent to the ocean, that in Paraguay, fifteen hundred miles from its mouth, large ships are seen, which have sailed against the current all the way, by the force of the wind alone; that is to say, which, on the beautifully inclined plane of the stream, have been gradually lifted by the soft wind, and even against the current, to an elevation greater than that of our loftiest spires. —*Arnott's Physics.*

COATING IRON WITH COPPER.

A patent has been granted to Theodore G. Bucklin, of Troy, New York, for a new and improved mode of coating iron with copper, which promises to be an invention of no small importance to the arts. It has long been a desideratum to coat iron with some other and less oxidizable metal, in order to render it more durable in exposed situations. It is more essential to have sheet and plate-iron than any other kind covered with copper. For example, sheet-iron covered with copper, would be cheaper than tinned iron for roofs of buildings, &c.; and plate-iron, if covered with copper, would

be excellent for making steam-boilers so as to prevent incrustations, &c. Cheapness is an important item in the process. If the process is expensive, then it can be of no general benefit, for pure copper would be preferable; if cheap, it is a most important discovery. A method of covering iron with brass, copper, &c., has long been known; but to cover it and make the copper unite with the iron, like tinned iron, has hitherto been considered problematical. The invention of Mr. Bucklin promises to fulfil every condition desired in making coppered iron. Cast, malleable, and wrought-iron can be coated with copper by the new process.

The process consists in first removing the oxide from the iron to be coated, then covering it with a medium metal which has a great affinity for the iron, and afterwards dipping the iron so prepared into molten copper, which, by the galvanic action of the medium metal, makes the copper intimately combine with the iron, and form a complete coating. The oxide is removed from iron by means of diluted sulphuric acid, in which the castings or sheets are rubbed with sand; after this they are washed and dipped into a solution of the muriate of ammonia, dissolved in a suitable vessel, when they are ready for the next process. This consists in dipping the sheets or plates into molten zinc, immediately after they are lifted out of the salammoniac solution. The surface of the molten zinc should be covered with dry salammoniac, to prevent the evaporation of the metal. The iron is soon covered with a coating of zinc, and forms what is termed galvanized iron. At hand the operator has a crucible or pot containing melted copper covered with some incombustible substance as a wiper, and he at once dips the zinced iron into this, in which it is kept until it ceases to hiss, when it is taken out and found to be covered with a complete and durable coating of copper. By dipping the iron thus coppered into the solution of salammoniac, then into the zinc, and the copper—repeating the process—coat upon coat of the copper will be obtained, until it acquires any degree of thickness. The black oxide is prevented from forming on the copper by dipping it afterwards in the salammoniac solution, and then washing it in pure water. This process is entirely different from that of Mr. Pomeroy, for which a patent was granted a few years ago. We have seen samples of Iron coated by Mr. Bucklin's process, which were very beautiful and well covered. Unless the melted copper was covered with a non-combustible substance, the plates would come out in a very rough state; but the covering acts as a wiper, and the coppered plates come out smooth and well coated. Brass, or any of the copper alloys, can be made to coat the iron, in the same manner as the copper. We hope this new process will be the means of extending the use of sheet-iron, so as to save considerable to the country that is now paid out for tinned sheets.—*Scientific American.*

Professor Bennet Woodcroft.—One of the most recent appointments made by the late ministry will, we think, give universal satisfaction. At all events we are sure that his very numerous friends in Manchester and Lancashire generally, as well as those of more recent date in the metropolis, where he has of late resided, will rejoice to learn that Professor Bennet Woodcroft—best known to the scientific world, perhaps, by his patent screw propeller for marine and river steamers—has received, in a way which reflects honour on all parties concerned, a responsible and permanent appointment—one for life, indeed—in a department where his intimate and extensive knowledge of its past history, and his practical acquaintance with its details, pre-eminently qualify him to discharge its important duties with the greatest possible benefit to the public service. The appointment is that of "assistant to the Commissioners of Patents," those commissioners being the Lord Chancellor, the Master of the Rolls, the Attorney-General, and the Solicitor-General. This appointment was conferred in the most handsome and flattering manner, and was wholly unsolicited and unexpected by Professor Woodcroft. We believe that Mr. Woodcroft will commence his duties immediately at the Patent Office, Southampton-buildings, late the offices of the now abolished posts of Masters in Chancery.—*Manchester Guardian.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING DECEMBER 30, 1852.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in the construction of fences.* (*Being a communication.*) Patent dated June 19, 1852.

These improvements apply principally to such fences as are constructed of iron, and consist in forming the uprights of flat bars placed at suitable distances apart, and having T-shaped grooves formed in them, in which the rails or rods are secured by means of loops or eyes formed at their ends. The rods are passed into the grooves, the peculiar shape of which admits of their being readily done from opposite sides, and the loops or eyes prevent their being withdrawn, except when raised to the upper part of the grooves. Screw-buckles may be applied to different parts of the length

of the fence, for the purpose of tightening up the rails. The straining of the different parts of the fence is prevented by the elasticity of the loops at the ends of the rails, compensating for the contraction or expansion of the metal-rods due to difference of temperature.

WILLIAM BURGESS, of Newgate-street, gutta percha merchant. *For improvements in the manufacture of gutta percha tubing.* Patent dated June 21, 1852.

The object proposed by Mr. Burgess is to enable gutta percha tubing to be bent into a variety of curves and yet preserve its tubular aperture clear. For this purpose he takes the tubing as manufactured, whether composed solely of gutta percha or of compounds of that material, and introduces into it a screw-threaded mandril which will exactly fit its bore. He then winds a tape round the exterior of the tubing and encloses it with the mandril in a casing, and introduces steam into this casing until the gutta percha is softened sufficiently to render it capable of being easily pressed into the grooves between the screw-threads of the mandril. For this purpose a cord of vulcanized India-rubber is used, which is wound round the exterior of the tube progressively from end to end, the tape being removed as the cord is wound on; and in order to prevent the tape adhering to the gutta percha, it should have been covered with soft soap previous to being wound on. The mandril, which should also have been covered with soft soap, is then removed from the tube by unscrewing it, and the tube is in a complete state for use. Other forms of corrugated mandril than a screw-threaded one may be employed, and other means adopted for forcing the heated gutta percha into the corrugations.

Claim.—The manufacture of gutta percha tubes made with corrugations, in order to render them flexible.

JAMES HIGGIN, of Manchester, manufacturing chemist. *For certain improvements in bleaching and scouring woven and textile fabrics and yarns.* Patent dated June 24, 1852.

The peculiar feature of Mr. Higgin's process is clearly stated in the claims, which are—

1. The combining together in a mixture soda ash, or caustic soda, resin or resins, and lime for the purpose of boiling cloth or yarns to be bleached and scoured.

2. Any mixture of resin or resins with soda or alkali, and lime, to be used in boiling cloth or yarns.

ALEXANDER JOHNSTON WARDEN, of Dundee, manufacturer. *For improvements in the manufacture of certain descriptions of carpets.* Patent dated June 24, 1852.

The descriptions of carpets alluded to are Brussels, cut pile, Kidderminster, Venetian, and some others of a similar class, and the improvements consist in the use or employment for their production of "jute" or "jute hemp" (corchorus capsularis), prepared by boiling in alkaline and acid solutions, and washing, and made into yarns of suitable size either in an unbleached or bleached state. The ornamenting of the carpets may be effected by weaving with coloured yarns, or by printing a pattern on the manufactured article, or by a combination of these means.

The claims embrace the process of preparing jute to be used as above described, and also the modes specified of manufacturing carpets therefrom.

CLAUDE ARNOUX, of Paris, gentleman. *For certain improvements in the construction of railway carriages.* Patent dated June 24, 1852,

The present patentee proposes to mount the bodies of railway carriages on frames constructed similarly to those of carriages for common roads; the axles being capable of shifting with respect to each other, instead of being fixed in parallel positions. He also uses two axles only for each carriage, and fixes the necks of the axles so as to be capable of shifting with their wheels independently of each other. The carriages are connected together by means of links, which are attached between poles extending lengthwise throughout the middle of the under framing of the vehicle. The carriages are guided, not by the action of the wheel-flanges against the rails, but by friction-wheels supported in inclined positions from brackets on the under part of the frame, which run against the inner side of the rails.

Claims.—1. The mode of constructing railway vehicles, by which they can be directed on the rails without coercion or undue resistance, whatever may be the train.

2. The setting railway vehicles on two axletrees, and the turning of the axletrees at discretion in chairs, to facilitate the traction and avoid the axletrees clutching.

3. The jointing the fore and hind axletrees of vehicles on railways.

4. The grinding the axletrees of vehicles on railways, as described.

JOSEPH HART MORTIMER, of Hill-street, Peckham. *For improvements in lamps.* Patent dated June 24, 1852.

The *first* improvement has relation to lamps burning moulded tallow, and consists in forming the wick-holder, when attached to the nozzle of the lamp, of some non-conducting material, instead, as usual, of metal.

The *second* improvement has relation to the lamps of the class in which the tallow or material burnt is melted by the heat of the lamp before passing to the burner, and consists in applying a float in connection with a valve to regulate the supply of material to the burner.

SAMUEL LUSTY, of Birmingham. *For improvements in manufacturing wire into woven fabrics and pins.* Patent dated June 24, 1852.

The "improvements in manufacturing wire into woven fabrics" consist in employing for that purpose power-looms, in which the giving off of the warp from the warp-beam is governed by friction applied to the beam, and the woven fabric is taken off between pressure rollers. The form is also so arranged as to stop on the breakage of any thread, and the weft is worked in with shuttles, in which the wire is wound on an axis placed across the shuttles.

The "improvements in manufacturing pins" consist of an arrangement of machinery for cutting wire into lengths, heading these lengths by means of dies and pressure, and then conducting them to the pointing apparatus, where they are pointed and finished by rotary files.

THOMAS BELL, of Don Alkali Works, South Shields. *For improvements in the manufacture of sulphuric acid.* Patent dated June 24, 1852.

Mr. Bell's *first* process for manufacturing sulphuric acid consists in applying currents of electricity for the purpose of assisting the conversion of the sulphurous fumes in the acid-chamber, so as to dispense in a great measure with the use of nitre or nitric acid, as at present practised. The currents of electricity may be produced by jets of steam in the manner followed in Armstrong's hydro-electric apparatus, or by any other means.

The *second* process consists in obtaining and applying continuous streams of ozone to act on sulphurous acid gas, which is also supplied continuously to the acid vessel, for the purpose of converting the same into sulphuric acid.

Claims.—1. Applying currents of electricity in sulphuric acid-chambers or apparatus, thereby promoting the union of oxygen and sulphurous acid.

2. Obtaining and applying ozone to act on a continued production of sulphurous acid in the manufacture of sulphuric acid.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated December 8, 1852.

992. John Browne. Improvements in machinery or apparatus for preventing the escape of smoke from chimneys, and consuming or otherwise disposing thereof.

996. John Symonds and George Mouchet. An improved mode of cleaning or scaling metallic surfaces.

998. Donald Beatson and Thomas Hill. Improvements in the means of propelling ships and other floating vessels.

1000. James Lawrence. Improvements in the manufacture of projectiles.

1002. James Spotswood Wilson. Improvements in propelling.

1004. Joseph Hopkins. Improvements in obtaining a straight line parallel to the axis of the earth, or in rendering the axis of a tube or of a telescope parallel thereto.

Dated December 9, 1852.

1007. William Mather. Certain improvements in the method of spreading medicinal compounds upon leather to be used as plasters, and in the machinery or apparatus connected therewith.

1008. William Baddeley. Improvements in the manufacture of metal pipes.—A communication.

1009. William Allchin. Improvements in agricultural and other steam-engines.

1010. Edmund Hunt. Improved screw-propeller.

1011. Edward Thomas Loseby. Improvements in the construction of timekeepers, and in cases to be applied thereto.

1012. Charles Greenway. Improvements in anchors.

1013. George Collier. Improvements in the manufacture of carpets and other fabrics.

1014. Thomas Masters. Improvements in machinery or apparatus for cleaning knives and other steel articles.

Dated December 10, 1852.

1015. John Sheringham. Improvements in the construction of stove grates.

1016. Jonathan Caldwell Blackwell. Improvements in musical instruments.

1017. Alfred Thomas Jay. A safety letter-box.

1018. Thomas Abbey Smithson and George Hall Adam. An improved mode of suspending carriage bodies.

1019. James Derrington and John Chadwick. Improvements in cocks and valves for liquids and steam.

1020. Richard Archibald Brooman. Improvements in evaporating apparatus.—A communication.

1021. Julien Boilesve. An improved desiccating apparatus.—A communication,

Dated December 11, 1852.

1022. Thomas Boardman. Improvements in looms for weaving.

1023. William Rothera. Certain improvements in machinery or apparatus for manufacturing nails, screw blanks, and other similar articles of metal.

1024. George Duncan Howell. Improvements in ventilation.

1025. James Martin. Improvements in the composition of artificial fuel, and in the mode of manufacturing the same.

1026. Edwin Bates. Improvements in breaks for railway-engines and carriages.

1027. William Sorrell. Improvements in furnaces and fire-places for consuming smoke.

1028. Archibald White. Improvements in apparatus for retarding and stopping railway trains.

1029. Caleb Bedells. Improvements in reels.

1030. Stephen Green. Improvements in joining earthenware tubes and pipes.

1031. George Dixon. Improvements in the manufacture and refining of sugar.

1032. Timothy Morris and William Johnson. Improvements in depositing alloys of metals.

1033. Charles Ritchie. Improvements in apparatus for measuring fluids.

1034. John Thomas Way and John Manwaring Paine. Improvements in the manufacture of glass.

1035. Charles Griffin. Improvements in obtaining metallic copper from its solutions formed by nature, and in the various processes of purifying cupreous ores by means of water.

Dated December 13, 1852.

1036. Josiah Glasson. Improvements in boilers.

1037. Joseph Hamblet and William Dean. An improvement in the manufacture of bricks.

1039. George Mackay. An improved construction of stirrup.—A communication.

1040. George Mackay. An improved construction of paddle-wheel.—A communication.

1041. Alfred Vincent Newton. Improved apparatus for regulating the density of fluids.—A communication.

1042. Jules Lejeune. A new machine for washing house linen, and all kinds of textile articles that are employed in making them.

1043. Frederick Dangerfield. Improvements in the lithographic press.

1044. David Napier. Improvements in steam-engines.

1045. Henry Clayton. Improvements in the manufacture of bricks.

1046. William Henry Fox Talbot. Improvements in obtaining motive power.

1047. Abraham Ripley. Improvements in axles for railway wheels.

Dated December 14, 1852.

1048. James Bell. Improvements in railway chairs.

1049. Charles Edmond Magnant. Certain improvements in tanning.

1050. John Nicholes Taylor. Certain improvements in ship's windlasses and other winches.

1053. Isham Baggs. Improvements in obtaining or extracting gold and silver from their ores.

1054. John Henry Johnson. Improvements in fire-grates or fire-places.—A communication.

1055. William Johnson. Improvements in apparatus for the manufacture of aerated waters.—A communication.

1056. John Henry Johnson. Improvements in wind-guards or chimney-tops.—A communication.

1057. Josiah George Jennings. Improvements in constructing drains.

1058. Rudolph Appel. Improvements in anastatic printing, and in producing copies of drawings, writings, and printed impressions.

1059. Joseph Paul Marc Floret. An improved method of producing simultaneously gas-light and lime or plaster.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December* 28*th*, 1852.)

324. Thomas Restell. Certain improvements in chronometers, watches, and clocks, part of which improvements is applicable to roasting jacks.

378. Preston Lumb. Improvements in apparatus for cleansing coal.

384. Joseph Henry Tuck. Improvements in stuffing-boxes, and in packing to be used in stuffing-boxes, bearings, pistons, and valves, as set forth in his petition, recorded in the said office on the 14th day of October, 1852.

428. Richard Archibald Brooman. Improvements in vices.

456. Anthony Liddell. Improvements in stuffing-boxes, and in packing to be employed with stuffing-boxes and pistons.

672. Stephen Carey. Certain improvements in the construction of viaducts, arches, bridges, and other buildings, upon a non-expansion principle.

684. Thomas Dunn, and William Watts, junior. Improvements in the construction of railways.

716. Richard Barnes. Improvements in cocks or plugs for water or other fluids.

721. Caleb Bloomer. Improvements in the manufacture of anchors.

753. Robert Sandiford. Certain improvements in apparatus for block printing.

758. William Edward Newton. Improvements in knitting machinery.

895. Emile Martin. Certain improvements in the mode of extracting gluten from wheat, and for preparing and drying the same by mixing to several degrees of concentration.

928. William Morris. Improvements in the production of motive power, and in apparatus pertaining thereto.

932. William Taylor. Improvements in propelling ships and other floating bodies.

933. James Rothwell. Certain improvements in looms for weaving.

966. James Buchanan. Improvements in the treatment of flax, and other similar vegetable fibrous substances, and in the machinery employed therein.

970. Asa Lees and Thomas Kay. Improvements in machinery for spinning and doubling cotton, wool, silk, flax, and other fibrous materials.

971. Frederick Mackellar Gooch. Improvements in the construction of railway signals, and in machinery or apparatus for working railway signals.

978. James Smith. Improvements in paving roads and other surfaces.

991. Thomas Lovell Preston. A machine for making links for chains.

994. Henry Jenkins. Improvements in the manufacture of bracelets, brooches, and other articles of jewellery.

1000. James Lawrence. Improvements in the manufacture of projectiles.

1005. Emile Kopp and Frederick Albert Gatty. Improvements in printing or dyeing textile fabrics.

1011. Edward Thomas Loseby. Improvements in the construction of time-keepers, and in cases to be applied thereto.

1012. Charles Greenway. Improvements in anchors.

1013. George Collier. Improvements in the manufacture of carpets, and other fabrics.

1017. Alfred Thomas Jay. A safety letter-box.

1022. Thomas Boardman. Improvements in looms for weaving.

1031. George Dixon. Improvements in the manufacture and refining of sugar.—A communication.

1032. Timothy Morris and William Johnson. Improvements in depositing alloys of metals.

1033. Charles Ritchie. Improvements in apparatus for measuring fluids.

1034. John Thomas Way and John Manwaring Paine. Improvements in the manufacture of glass.

1036. Josiah Glasson. Improvements in boilers.

1041. Alfred Vincent Newton. Improved apparatus for regulating the density of fluids. A communication.

1044. David Napier Improvements in steam engines.

1045. Henry Clayton. Improvements in the manufacture of bricks.

1046. William Henry Fox Talbot. Improvements in obtaining motive power.

1051. John Webb. Improvements in ornamenting enamel watch dials.

1057. Josiah George Jennings. Improvements in constructing drains.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

1103. Juan Nepomuceno Adorno. Improvements in the manufacture of cigars, cigarettes, and other similar articles. Dated December 20.

1113. Charles Pilkington, Thomas Pilkington, and Abraham Pediger. An improved joiner's brace. Dated December 20.

WEEKLY LIST OF PATENTS UNDER THE PATENT LAW AMENDMENT ACT, 1852.

Sealed Dec. 28, 1852.

327. Jonas Lavater.

Sealed Dec. 31, 1852.

57. John Joseph Macdonnell.
84. Edwin Pettitt.
221. William Crosskill.
250. William Armand Gilbee.
382. Thomas Brown and John Cox.
440. Fennell Herbert Allman.
487. Archibald Slate.
493. George Price.
523. William Clarke.
557. Robert Mallett.
558. Henry Robert Ramsbotham and William Brown.
644. George Shand and Andrew Mc Lean.
680. William Thomas Henley.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Dec. 29	3403	D. Hawkins	Stratford on Avon	Two-wheeled vehicle.
30	3404	Villers and Jackson	Birmingham	Ever-pointed pencil.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Dec. 30	485	Mr. Shore	Canterbury	Music-holder.

TO CORRESPONDENTS.

A. S. L. inquires whether the same amount of magnetic energy would be developed in an electromagnet tapering from both its ends towards the middle as by a cylindrical one, the area of pole presented in both cases being alike? The attraction would be stronger in the form of core to which he alludes, because the current would be induced in a larger surface of metal. The expedient has been resorted to before, and sometimes with hollow cores. In that case, it is necessary to be careful that the thickness of the metal be sufficiently large for the action of the fluid.

Mr. Clement.—We consider the steam saw-mills of Mr. Worssam, of the Commercial Wharf, City Basin, and those of McDowall, of Johnstone, Renfrew, to be the best forms of the machine now in use. Mr. McDowall's last mill has not as yet, we believe, been illustrated. The question of cost cannot be answered satisfactorily by us, as a variety of circumstances would affect it.

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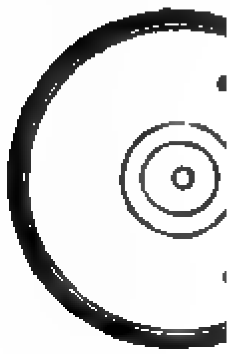
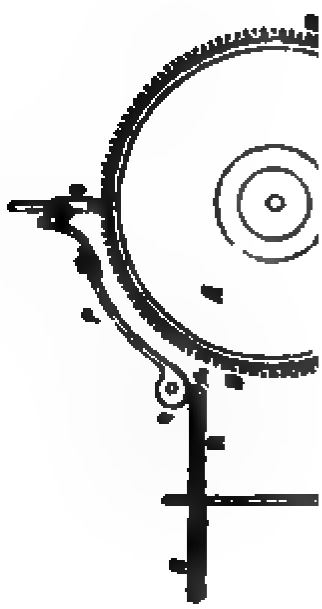
HOBLYN'S IMPROVEMENTS IN NAVIGATION.

Fig. 1.





HOBLYN'S IMPROVEMENTS IN NAVIGATION.

Patent dated June 28, 1852. Specification enrolled December 28, 1852.

This patent is directed to the accomplishment of two objects perfectly new in the art of navigation—first, by a self-acting mechanism, to trace out upon prepared charts the direction of a ship's motion, and the distance travelled: and, secondly, to adapt to an ordinary time-piece a chart, having the outline of any given line of coast inscribed upon it, and caused to revolve by clock-work in proportion to the ascertained mean speed of the vessel, so as to give by inspection an approximate knowledge of the part of the coast a vessel may be near at any particular time by the clock to which the chart is attached.

Fig. 1 is a side-elevation, and fig. 2 a plan, of an apparatus so constructed as to delineate the ship's course upon a sheet of paper wound upon a drum A. B is a second drum for holding a supply of paper for feeding the drum A. These drums are mounted in brackets upon a table in any convenient part of the vessel, such as the captain's apartment, where they will be of easy access and constant reference. The drum A is caused to revolve at a certain speed, previously ascertained in the usual manner by the log, by means of the toothed wheel D attached to one end. E is a shaft which carries the endless screw F, which gears into the toothed wheel D. G is a worm-wheel, also upon the shaft E, which is geared into by an endless screw H, upon the shaft I. K is another worm-wheel upon the shaft I, and also geared into by the endless screw L. This endless screw L is formed upon one end of the main-shaft M, which is prolonged through the bows of the vessel, and has keyed upon its outer end the vane-wheel N. This vane-wheel is placed below the surface of the water, and the forward progress of the vessel causes the wheel to revolve, and through the intervention of the worm-wheel, and endless screws already referred to, imparts motion to the drum A. O is a pencil, or tracer, attached to the holder P, which is centred upon a cross-shaft Q. This pencil O has a lateral motion upon the shaft Q, when actuated by the pulley R, around which a cord is wound, the two ends of which are fastened to a lug or projection *a* from the centre of the pencil-holder P. The pulley R is caused to revolve by means of a series of worm-wheels and endless screws SS, connected to a vane-wheel T. This vane-wheel T is placed at right angles to the wheel N, and serves to indicate the amount of deviation the ship may make from the straight course while tacking, or under the influence of winds or tidal currents. The result of these two vane-wheels is to cause to be delineated upon the paper on the drum A, as near an approximation to the line of the ship's course as possible, the deviation from the straight line being indicated by diagonal lines upon the paper by the vane-wheel T coming into operation when the ship is tacking, or otherwise influenced by the wind and currents. The paper upon the drums A and B may have marked upon them the chart of the ship's voyage, with the lines of the latitude and longitude, so that the particular point at which the ship may be at any particular time may be ascertained upon reference to the lines delineated by the pencil.

A modification of the above arrangement for indicating the ship's course is described in the patent. Instead of passing a paper or chart over a drum, and causing the lines to be drawn by means of a pencil, the patentee uses a portion or segment of the surface of a sphere on which is drawn the outline of the voyage. This segment is mounted upon a spindle or shaft centred by a pivot, and a counterpoise attached to the lower end of the shaft, for the purpose of always keeping the segment A in equlibrium. An electro-magnet is attached to the counterpoise, by means of which the segment is retained in its position, north and south, independently of the line of the ship's course; so that when the vessel is tacking, or under the influence of head winds, or other contingencies, the line upon the surface of the segment shall indicate the ship's course.

A wheel or marker, having a number of fine points upon its circumference is caused to revolve by means of an endless screw actuated by the rotation of a, vane, similar to the one represented. This marker, or indent, upon the surface of the segment, is a line which will be as near as possible a representation of the course in which the vessel is proceeding.

The second portion of the invention consists of a circular chart, which is attached to the striking portion of a time-piece, but in such a manner that the chart shall revolve upon its centre at certain regular intervals of time, and also at a fixed rate of speed. The speed with which the circular chart revolves must be as near as possible in true accordance with the ascertained speed of the vessel. An index points out on the chart the particular portion of the whole coast the vessel may be passing. The circular charts are capable of being removed, so that any other chart constructed upon the same principle, and representing any other portion of coast the vessel may be dispatched to, may be placed upon the spindle of the time-piece.

ON THE CALCULATIONS USED IN MEASURING THE STABILITY OF SHIPS.

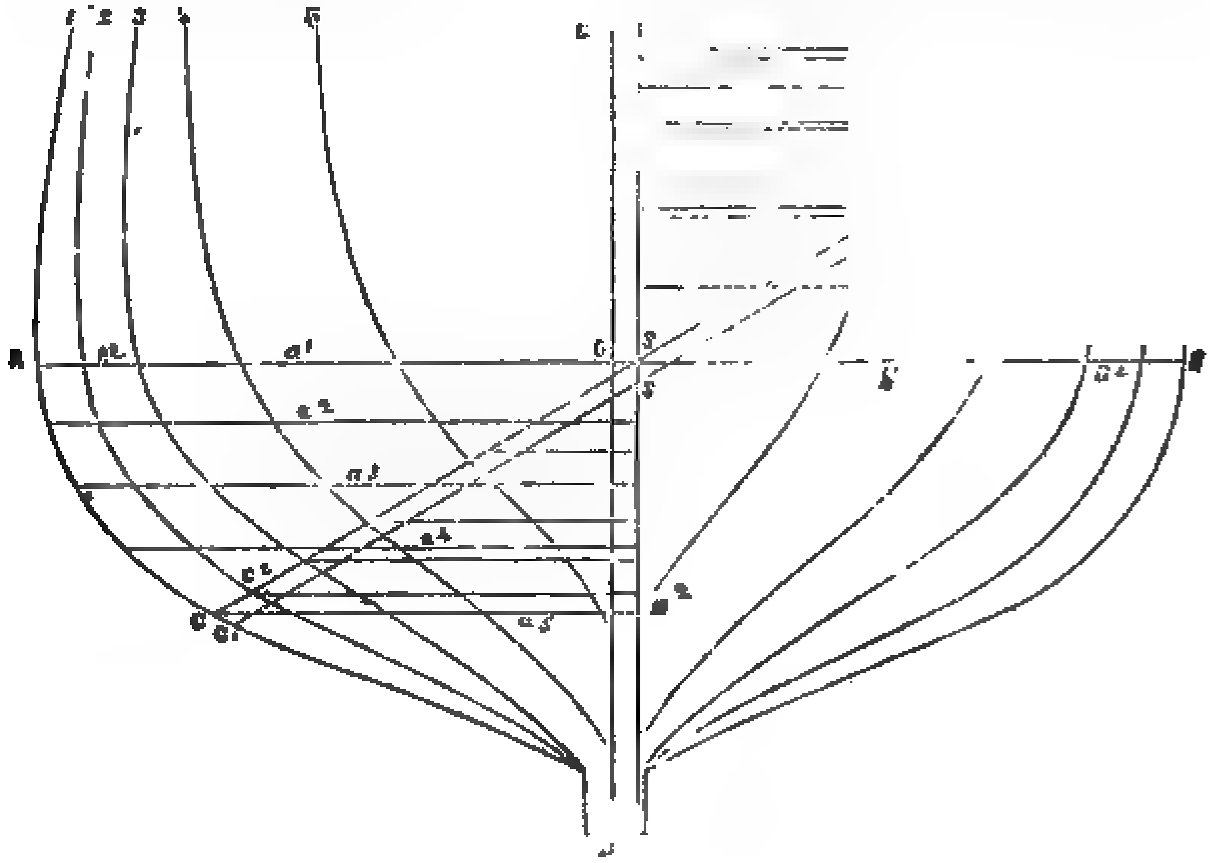
(COMMUNICATED BY DR. WOOLLEY, PRINCIPAL OF H.M. SCHOOL OF NAVAL CONSTRUCTION, PORTSMOUTH.)

(Continued from page 5.)

Let the ship be divided into any even number of slices by planes parallel to ADB, both fore and aft separated by a common interval m.

Figure 2 represents the projections of these sections numbered 1, 2, 3, &c., for the fore-part of the ship projected on the plane ADB.

Fig. 2.



From C where SO cuts the section 1, draw CM perpendicular on SM (a vertical line through S); divide SM into any number of equal intervals: four will be generally sufficient for the greatest angles; two will suffice in many cases—and from the points of division draw ordinates parallel to ASB to the section (1). These are the lines a_1, a_2, a_3, a_4, a_5, in the figure.

The area ASMC may be calculated by the ordinary rule, viz.:

$$\text{Area} = \frac{m}{3}(a + 4b + 2c),$$

where a = sum of first and last ordinates,
b = sum of even ordinates,
c = sum of all the odd ordinates, except the first and last, and m = the common interval.

Generally suppose the number of ordinates $2n+1$ and the interval l.

Then area $ASμC = \frac{l}{3}\left\{a_1 + a_{2n+1} + 4(a_2 + a_4 + \&c. + a_{2n}) + 2(a_3 + a_5 + \&c. + a_{2n-1})\right.$

and area of $\triangle SMC = 6\frac{1}{2}SM \times SC = nla_{2n+1}$

∴ Area ASC = area ASMC − △SMC = A_1 suppose. Similarly by drawing DM parallel on SM′, and proceeding in the same way, we may find area BSD = B_1.

From C_2 where the second section 2 is crossed by SC draw $C_2 M_2$ perpendicular on SM; divide SM_2 as before into as many even intervals as may be convenient, and proceed to calculate the area AS_2C_2 as before, and find in the same area $B_2 SD_2$; and so on for all the other sections.

Then using $A_1 A_2 A_3$, and B_1, B_2, B_3, &c., for ordinates of two curves separated by common interval m, we may by Simpson's rule find the volume of the *out* and *in* for the *fore*-part of the ship. Proceed in the same way for the volume of the *out* and *in* aft.

Let O and I be the whole volumes of the out and in thus found. Then O ought to be equal to I; if it is not it arises from the point S being wrongly chosen. Before proceeding with any other calculations the proper position of this must be found. Let S′ be that position. Draw C′ S′ D′ parallel to CD.

Then volume on base AS′ C′ = volume BS′ D′.

Volume AS′C′ = volume ASC + prism on base CSS′ C′

Volume BS′D′ = volume BSD − prism on base DSS′ D′.

Hence O − I = prism on base CDD′ C′, = area of inclined load water-line CD × SS′ sin θ nearly. Whence

$$SS' = \frac{O - I}{\text{area of inclined water-line.}} \times \sec.\ \theta.$$

The point S being thus accurately found, we may proceed with the other calculations.

For section (1) multiply $a_1, a_2, \ldots a_{2n+1}$ by $o \times l, l, 2l, \ldots 2nl$ respectively, and use the products so found for ordinates of a curve with common interval l; this gives the moment of the whole area ASMC with respect to plane AB.

But the moment of the △ CSM with respect to the same plane

$$= nl \times a_{2n+1} \times \frac{4}{3}nl = \frac{4}{3}\,nl^2 a_{2n+1}.$$

Subtracting this from the moment before found, we get the moment of the area ASC about AB.

Also squaring

$$a_1, a_2, \ldots\ldots a_{2n+1}.$$

and taking one half of the squares for ordinates with common interval l and, summing by Simpson's rule, we obtain the moment of area ASMC, about the vertical longitudinal plane through S. Moment of the △ SMC about the same plane

$$= nl \times a_{2n+1} \times \frac{1}{3}a_5 = \frac{1}{3}\,nl\,a^2_{2n+1}.$$

Subtracting this from the former, we get the moment of area ASC about plane SM. Proceed in the same way for the moment of the area BSD; and also for all the sections 2, 3, &c., to the foremost one: we then get, by addition, the moments of the wedges on bases ASC, BSC for the fore-part of the ship, with regard to the horizontal and longitudinal planes. Proceed in the same way for the aft part, add together the moments of both *in* and *out* for the vessel to each plane, and multiply the whole by weight of a cubic foot of water.

The first sum = moment of in and out with regard to plane AB.

$$= w(gm' + hn') = \text{W.HN},$$

and the second sum = moment of in and out with regard to longitudinal plane through S.

$$= w.m'n' = \text{W.NP}.$$

The rule derived from this method is very evident. It would be well in every calculation to make a table of ordinates and squares of the ordinates for each transverse section, both for the *in* and *out*, and place above it the common interval for that section, which, it will be observed, varies for every section, as also for the *in* and *out* in each section.

The calculations would, of course, be easier if those common intervals were equal, or were in some proportion; but this cannot generally be the case. This makes the calculations somewhat tedious; but then it must be remembered that for each section the number of ordinates is small, which renders the

application of the rule so far easy and simple.

To finish the calculations, multiply the areas A_1, A_2, &c., for the *out* by $0, m, 2m$, &c., respectively, and using these products as ordinates and common interval m, apply Simpson's rule: the result is, the moment of the *fore out* with regard to plane AD B. In the same way find the moment of the *aft out* with regard to the same plane.

Then moment of *fore out* − moment of *aft out* = moment of whole *out* with respect to plane AD B $= wa$.

In the same precisely find wa' = moment of *in* with respect to the same plane.

Then $Wx = wa' - wa$ is found.

If moment of *aft out* exceeds numerically the moment of *fore out*, the algebraic sign of wa will be negative; the same holds also for the sign of wa'.

The chief objection to this method lies in the comparative confusion of the ordinates to the different sections on the figure or plan which is used for admeasurement. A little care, however, and experience, would soon overcome this trifling difficulty.

It is evident that the method which is here proposed gives the measures of the quantities whose values are sought, with as much accuracy as the nature of an approximation will admit—as far, that is, as Simpson's rule can be depended on—which experience has shown to deviate *very little* from the truth, where proper care is taken not to make the intervals too great.

The calculator would do well to draw in the curve HP^1 (fig. 1) for the locus of the centres of gravity of displacement, which would be a material assistance in giving him an idea of the rolling qualities of the ship (as before observed), and would serve as a basis for approximating to the time of the vessel's oscillation when it has been displaced through a considerable angle.

All this, of course, takes time and trouble; but when we consider the length of time consumed in the building of each ship, the magnitude of the interests entrusted to its keeping on a most treacherous element; and the loss, not only of valuable property, but of human life, which an error of construction might involve,—the few days, or even weeks, which must be spent in calculating *accurately* the various elements, are as nothing in the balance, and should never be admitted as an excuse for neglecting this *most necessary work*.

THEORY OF THE MAIN SPRING OF A WATCH.

THE last Number of the *Journal of the Franklin Institute* contains an excellent article on the Theory of the Action of the Main Spring of a Watch, by Mr. Alexander Young, of Camden, South Carolina. In this paper, a practical rule well worthy of attention is investigated, for selecting and adjusting a spring that will fit in every respect without trying it in the barrel. The spring-barrel is supposed to be divided into four quarters. The quadrantal area is divided into nine equal parts by concentric quadrants, eight of which are intended to exhibit the theory of the action of the spring. A concentric circle, of one-third the radius of the barrel, is the space for the arbor, and a scale of twenty-four equal parts is applied to the radius—each part being equal to the thickness of the spring, which is estimated by the proportion it bears to the diameter of the barrel. If the proportion of the spring to the diameter of the barrel be 1 to 72, it will be found that two coils of the spring placed in the outside space will fill it, and, if wound on the arbor, will fill the inside space, making five coils. If it is attached to the barrel and arbor, as usual, it will cause three revolutions in expanding back to its first position. Nineteen coils will fill the seven outward spaces; and if wound on the arbor, the seven inward spaces with twenty-two coils; having the same difference and revolutions as above, but with greater power, and the action will be more uniform.

Nine and one-sixth coils will fill the four outside spaces, and when wound on the arbor, the four inside spaces increased by five and two-thirds coils. The spring has most action when it fills four spaces, or half the barrel; if it extends to the middle of the fifth space, it will lose one-sixteenth; if to the whole five spaces, one-quarter of a revolution, but will gain in power, and transmit it more uniformly. A scale for any thickness of spring can be applied to the same figure.

The following is a Table of the radii of the circles that divide the spring-barrel into nine equal spaces, and also of the number of revolutions taken from them, which are equal to the number of coils that the spring has when wound on the arbor, over the

number it has when expanded against the rim of the barrel.

The two middle spaces are subdivided, and the radii of the two circles and the revolutions made by those divisions are interlined:

Radius of the Circles.	Revolutions.
36,000	—
33,940	2,910
31,754	4,531
29,392	5,392
28,142	5,597
26,832	5,664
25,455	5,597
24,000	5,392
20,777	4,531
16,970	2,910
12,000	—

Mr. Young then proceeds to describe a sectorial instrument which he employs for selecting the spring, and the construction of which depends upon the foregoing considerations. This instrument is, in fact, a sector and callipers combined.

The long or sectorial end is four inches in length, and is divided from the centre of the joint on both legs, into one hundred equal parts; the divisions opposite to 60, 70, and 80, are marked 4, 5, and 6, corresponding to the numbers for the revolutions of the barrel in the Tables. It has a clamp and screw limiting its opening to one inch.

The short or calliper end is four-tenths of an inch, and opens to one-tenth, or as ten to the distance across from any two corresponding numbers on each leg of the sector.

The following Table shows how many revolutions of the barrel will be produced by the different thickness of the spring. A deduction is made for attachments at the ends, and for the soft part of the spring not unwinding from the arbor, and may amount to one-third of a revolution for a spring of one-eightieth, and to three-quarters when it is one-sixtieth of the diameter.

Coils of the spring to the diameter of the barrel.	Revolutions by theory.	Revolutions by experiment.
60	4·72	4·0
62	4·88	4·2
64	5·04	4·4
66	5·19	4·6
68	5·35	4·8
70	5·51	5·0
72	5·66	5·2
74	5·82	5·4
76	5·98	5·6
78	6·14	5·8
80	6·30	6·0
82	6·46	6·2
84	6·61	6·4

To select a spring for any number of revolutions, open the sector to the radius of the barrel at the number on the scale for the required revolutions, the callipers will then just admit five coils of a spring when of a suitable thickness.

To find the weight of a spring for any size of barrel, take the inside diameter in hundredths of an inch, which is done by opening the sector to its limit, then apply the barrel cap to reach across from side to side, to the same numbers on the counterpart scales, which will be the diameter. The width of the spring is found in the same way. Then enter the table with the diameter of the barrel, take out the three opposite figures, and multiply by the width of the spring, which gives the weight in troy grains for a spring that will fill nine-sixteenths of the barrel.

The Table is constructed by taking the area of the arbor from the area of the barrel in hundredths of an inch. Nine-sixteenths of the remainder multiplied by 1,900, the grains, in a cubic inch of watch-spring, gives the numbers for the Table.

If the arbor is less than one-third of the barrel, the callipers should fit tightly, and the spring have full weight; if larger, the callipers should fit loosely, and the spring have short weight.

Diameter of the barrel in hundredths of an inch.	Weight of the spring in grains troy.
50	1·86
51	1·94
52	2·02
53	2·10
54	2·18
55	2·26
56	2·34
57	2·42
58	2·51
59	2·60
60	2·69
61	2·78
62	2·87
63	2·96

Diameter of the barrel in hundredths of an inch.	Weight of the spring in grains troy
64	3·05
65	3·15
66	3·25
67	3·35
68	3·45
69	3·55
70	3·65
71	3·76
72	3·87
73	3·98
74	4·09
75	4·20

The next Table is constructed by experiment with a spring twelve-hundredths of an inch wide, filling five spaces, or five-ninths of a barrel, sixty-seven-hundredths of an inch in diameter, of which the thickness of the spring is one-seventy-eighth, and weighs 45 grains. The barrel having the chain lapped round it, with a scale for weights, and held fast by the arbor, when the weights are put in the chain, will unrol; the weights required for each revolution are noted, and placed in the Table. The spring is then taken out, and its length reduced by breaking off 4½ grains; when replaced, proceed as before, placing the results in the second column of the Table. Then remove another 4½ grains, leaving 36 grains of the spring. The weights applied as before, gives the numbers for the third column of the Table, which shows the intensity of the spring at the end of each of the five revolutions; when it fills five, four and a half, and four spaces.

	Troy ounces sustained.	Ounces sustained; four and a half spaces filled.	Ounces sustained; four spaces filled.
	9	8	7¼
	12	11	10¼
	14	13	12¼
	16	15	14¼
	18	17	16¼
Sum,	69	64	60¼
No. of revolutions,	5⅜	5⅝	5⅝

The sum for each column gives the weight raised to a height equal to the circumference of the barrel. The greatest amount of power is obtained when the five spaces are filled; with four only, there will be more left over the five revolutions, but not sufficient to compensate for the loss of power.

The spring of the best watches fills four and a half spaces, and has a revolution over, to allow for straining up, and still leaving a part free.

The sector, the table, which can be copied on a card, and a pair of small scales, with grain weights, are all that is required to select a spring that will have the desired number of revolutions, and the greatest power that the capacity of the barrel will admit of.

EXHIBITION OF RECENT INVENTIONS AT THE SOCIETY OF ARTS.

M. Froment's apparatus (exhibited by M. Fontainemoreau) for illustrating the rotary motion of the earth has already been noticed. "M. Fontainemoreau's Altometer consists of a brass tube, provided with a sight-hole at one end, and a pair of cross-hairs at the other. An arc of a circle is attached to the latter end, which is perforated with three small holes. A weight or handle serves as a plummet, and the arc moves up or down as the tube is more or less inclined." By this instrument, which may be carried in the pocket without inconvenience, the elevation of all accessible or inaccessible objects, such as mountains, steeples, &c., may be readily ascertained.

An Arithmometer; or, calculating instrument. By T. de Colmar. (Exhibited by M. Fontainemoreau.) By means of this instrument the most complicated rules of arithmetic may be applied with infallible accuracy and astonishing rapidity, without requiring any effort of the mind on the part of the operator. To make use of the machine, it is only necessary that he should be able to read figures, and follow the printed instructions. Addition, subtraction, multiplication, division, and the extraction of the square root, are effected with equal ease and rapidity, and so simple is the working of the machine, that a child may perform the most lengthened operations.

M. Fontainemoreau also exhibits an Ameroid Barometer.

Goss' Improved Theodolite. (Manufactured and exhibited by Mr. W. Muir.)

The principal improvement in this instrument is an arrangement of the centres, by means of which the adjustments of the levels and of the line of collimation, are made dependent on the inner centre alone. The divided plate moves on a centre independently of the adjustments; so that if the plate were taken away from the instru-

ment, it would still be in perfect adjustment for levelling and taking vertical angles. By casting the centre and the uprights that carry the horizontal axis in one piece, and also the cradle that holds the telescope and the axis in one piece, the instrument is made much stronger, with a considerable reduction in weight. By placing the vertical arch outside the uprights, the weight is reduced, and the reading off simplified.

A Piano-forte, by T. Statham. This is an elegant instrument of great power and susceptibility of expression, into which an improvement has been introduced by the application of metallic stops to the wrest-plank and sounding-board.

Hobbs and Co.'s "Solid-key Locks." In these locks the solid stump is attached to a moveable piece, instead of being riveted into the bolt, as is the case in other locks. This renders it impossible to ascertain the proper position of the tumblers, and the lock is secured against being picked.

Messrs. Hobbs and Co. likewise exhibit their "Permutating Lock."

Parnell's Defiance Lock.—Access to this lock is prevented by a solid cylinder of hardened brass, with protecting wards extending the whole depth of the lock, and having in the centre the aperture for the key, which fits with great nicety, so as to preclude the possibility of any second instrument being used to open it. The key, when not in the lock, appears like a highly polished "blank," or key before the wards or bits are cut in it. In this form it enters the lock, and moves the edge of a steel plate or eccentric. The moment the key begins to move, the bits corresponding to the levers are gradually forced out by its action round the eccentric plate, so that when it reaches the side-detector it has become slightly elongated, and by the time it has arrived at the levers, it has expanded about one-third its whole length, when it begins to move the bolt.

Blyth's Manure-Distributor, manufactured and exhibited by R. Garrett and Son.—In this machine, a shaft, with prongs attached to it, revolves in the manure cylinder, and raises tongues which scrape the prongs, and discharge the manure into a shoot or conductor. Alternate lines of wire are placed in this shoot, to pulverize the manure still further.

Boyd's Improved Scythe.—This implement is furnished with a simple mechanical arrangement by which its blade can be adjusted to any required inclination, and its curvature regulated within certain limits.

A Lawn-Mowing Machine, by Mr. B. Samuelson, of the Britannia Iron-Works, Banbury.—The object of this machine is to reduce the labour of mowing, and improve the appearance of lawns. The carriage enables any unskilled labourer to work it, and the draught is very much less than that of the old "Budding's Lawn-mower."

Messrs. Cogan and Co. exhibit several excellent specimens of dairy and horticultural glass. Amongst them is a glass churn. The barrel is made of strong glass. Dashers, fixed to a vertical shaft, radiate against stops or projections in the barrel. The centre part of the glass is raised in a point upon which the hollow of the vertical shaft works, thereby rendering the objectionable metal spindle unnecessary.

There is also a specimen of a syphon, used for separating milk from cream. This simple and effective instrument consists of a semicircular tube, through which a piston works; one end being placed in the vessel containing the new milk, and the piston being withdrawn, a vacuum is formed, and the milk flows through the pipe into another vessel, leaving the cream behind.

Also a churn thermometer, of the ordinary construction, but graduated to the churning temperature. Lactometers, and glass pails having gutta percha handles, and their bottoms protected by wicker shields, also form part of the collection.

Wilkins's Running-Rein Bridle. — This bridle is said to be capable of holding the hardest pulling horse, and may be used in place of a martingale, on a horse requiring one, or on one having an easy or light mouth, by making a slight alteration in the use of the curb.

Penny's Victoria Bridle.—This piece of harness is a highly successful attempt at an artistic decoration of the mountings.

Mr. C. A. Preller has seventeen specimens of leather, tanned by a new process, consisting in the application of a composition which has the consistency of grease. The original fibrous texture is preserved, and no immersion in any liquid, for the purpose of being acted upon by tannic or other acid, being required, the leather will be found of greater density and durability than hitherto. Heat and damp do not make it hard and fleshy, and when exposed for several hours to the action of boiling water it does not lose any of its pliability.

A Parallel Ruler, by H. Stephens. — In this instrument, which is on the roller principle, there is a peculiarity of formation of the ruling edge, by which the pen is kept from contact with the ruling parts on the paper, so that soiling the fingers or the paper is completely prevented.

Messrs. Ellwood and Sons exhibit their *Air-chamber Hat.*—This hat has a double

case, intended to prevent the direct action of the sun in India or other hot climates. The chamber itself communicates with the air by means of perforations in the rim.

Mr. J. H. Johnson exhibits a drawing of *Fulton's Self-Fitting Ventilator Hat.* — This hat has a loose lining, supported simply by slight blade springs. It affords an easy self-adjustment to the head, giving the hard non-fitting hat-body a perfect fit like a soft cap.

J. Coate and Co.'s *Penetrating Hair-brush.* — The rows of hair being placed in the back in diagonal lines, and the alternate rows set the one at right angles and the other at acute angles, gives the brush a much greater penetrating and cleansing power than any now in use.

Thomson's *Telescopic Slush-lamp.* — This lamp consists of two tubes, the one within the other; the inner one contains the wick, and the outer purified grease, which is pressed up into the wick by the lower part of the tube.

The Countess of Ellesmere. — The iron steam vessel, *Countess of Ellesmere*, performed an unprecedented feat on Saturday last, making two trips to Runcorn and back in one tide. She left George's Pierhead at 8·30 a.m. (high water being at 10·45 a.m.), and got back on her second trip at 1·30 p.m.; thus occupying only five hours, including stoppages, in running a distance of about 70 miles! Allowing three-quarters of an hour for the various stoppages at Runcorn and Liverpool, and considering that two of the trips were made with, and two against, the tide, her actual speed through the water must have been 16 to 17 miles an hour; a great result from a vessel of only 18 horse power, when the strong gale of wind that blew during the greater part of the morning is taken into account, and that she was loaded with passengers. The *Countess of Ellesmere* was built by Mr. Laird for the trustees of the Duke of Bridgwater, for improving the passenger transit between Liverpool and Runcorn; and her performance on Saturday last proves not only that she has accomplished that object, but that she is the fastest steamer sailing from the Mersey.—*Liverpool Albion.*

The Niagara Suspension-bridge. — Labourers are busily employed in pushing the Niagara Suspension-bridge to completion. In remarking on the structure, the "Lockport (United States) Journal" says: —"Imagine a span 800 feet in length, forming a straight hollow beam 20 feet wide, and about 18 feet deep, with top, bottom, and sides. There will be an upper floor to support the railroad and cars, 20 feet wide between the railings, and suspended by two wire cables, assisted by stays. The lower floor, 19 feet wide and 15 feet high in the clear, is connected to the upper floor by vertical trusses. The cohesion of good iron wire, when properly united into cables or ropes, is found to be from 90,000 lbs. to 130,000 lbs. per square inch, according to quality. The limestone used in constructing the towers will bear a pressure of 500 tons upon every square foot. The towers are 60 feet high, 15 feet square at the back, and 8 feet at the base. When this bridge is covered with a train of cars the whole length, it will sustain a pressure of not less than 405 tons. The speed is supposed to add 15 per cent. to the pressure—equal to 61 tons. The weight of superstructure added—estimated at 782 tons—makes the total aggregate weight sustained 1,273 tons. Assuming 2,000 tons as the greatest tension to which the cables can be subjected, it is considered safe to allow five times the regular strength, and providing for a weight of 10,000 tons. For this 15,000 miles of wire are required. The number of wires in this cable is 3,000; the diameter of the cable about 9¼ inches. The bridge, we believe, is the longest between the points of support of any in the world."

THE TRADES OF BIRMINGHAM.

IMPORTANT changes in the value of raw material have taken place within the last few days, and are calculated to produce very important results. Tuesday last the price of tin was advanced 4*l.* 10s. per ton, the quotations sent out from the principal houses being as follows:—Tin in blocks 103s. 6d. per cwt.; and ingots, bars, refined in blocks, plate grain, and granulated, up to 125s. 6d. The discounts have also been reduced on six months' acceptance from 1½ to 1, and from 2½ to 2 for cash. Coal and iron have also advanced.

The steel-pen trade has been unusually brisk during the past fortnight. The demand for these articles from France has been greater than usual at this season, and the orders from South America have also been large. The pearl-button trade still suffers from scarcity and dearness of shell, and there is little probability of an increase in the supply at present. Owing to the great deficiency of the shell, other materials are now being substituted, such as horn, bone, and hard wood, but they do not seem to find favour.

At Smethwick, the utmost activity prevails at the large works, some recent contracts having been entered into. Fox, Hen-

derson, and Co., of the London works, are still busily engaged in iron-work for the Grand Central Station in New-street, and Messrs. Atbury, cannon-makers, are now executing an extensive order for guns. At the large railway carriage and truck manufactory of Messrs. Wright, of Saltley, and Brown and Marshall's, Canal-street, a considerable number of first-class carriages are being made, the greater number intended for shipment to the continent, and trucks for lines in our immediate locality.

A good indication of the general state of trade may be found in the demand for workmen in the various branches. Brass casters, brass rule-makers and printers' joiners, brass and copper-tube drawers, jewellers, gold-chain makers, gun-finishers, casting pot-makers, and nail-cutters are in requisition at good wages in Birmingham and neighbourhood, and able mechanics may find employment.

The brassfounders are already looking forward to a brisk spring trade. The tin-plate business is more than ordinarily good, and great difficulty is experienced in obtaining efficient workpeople. Welsh competition appears to fall harmless upon the Staffordshire makers, who now weekly export immense quantities of plates from Liverpool for the American market.

THE IRON TRADE.

Dudley.—The usual preliminary meeting of the ironmasters of South Staffordshire, and the neighbouring counties, was held at the Swan-hotel, Dudley, on Thursday afternoon last, for the purpose of considering the present condition of the trade, and fixing prices for the ensuing quarter. The meeting was most numerously attended; indeed, a larger meeting of masters for a similar purpose has not been held since 1845. Every house of note in the district was represented, and amongst those present we noticed Messrs. Barrows, Forster, Haines, B. Williams, W. Williams, Browning, Matthews, Smith, Sparrow, &c., M. Glazebrook, Esq., chairman, presided. The subject of prices, and the propriety of advancing was introduced, and a discussion ensued, which resulted in an unanimous resolution to advance 20s. per ton upon present prices. It was also agreed to advance the workmen's wages in proportion to the increase of price on iron.

Birmingham.—The main feature in the state of trade this week has been another advance of 20s. per ton for bar and sheet iron, and for other descriptions in proportion. Plates are now quoted at from 12*l.* 10s. to 13*l.*, and bars and rods at 11*l.* The prices of pigs are arbitrary, for none were mentioned at the preliminary meeting held at Dudley on Thursday. A reduction in the price of Scotch pigs during the present week at first created some little excitement, and tended towards a depression of the market, but this temporary feeling of distrust was soon overcome. One eminent iron-master refused an order for 20,000 tons of pigs, at 5*l.* 10s., and is now selling hot blast-mine pigs at 6*l.* 10*s.* per ton. The result of the excessive speculation in pig iron must be the continuance of the present prices of manufactured iron for several months to come. The Americans, aware of the rapid rise in prices, sent over large orders by the steamer on Monday, and fearing that their demands would not be supplied, the orders were given without limitation as to prices. The home demand, too, for manufactured iron is very great, especially in sheets, for the construction of vessels to supply the present scarcity of shipping.

Staffordshire.—The iron trade continues as brisk as ever. Last week a telegraphic despatch was received in Dudley, announcing the reduction of Scotch pigs 10*s.* per ton, which caused a little nervous excitement with some of the holders of pigs; but this reaction may be attributed to the fact of Scotch pigs going up to 78*s.* per ton from 63*s.* during the last fortnight or three weeks, and they suddenly receded again to about 70*s.* Speculation, no doubt, had something to do with this, for an eminent ironmaster in this district was subsequently offered 5*l.* 10*s.* for 20,000 tons of pigs; but he refused it, and is now selling hot blast mine pigs at 6*l.* per ton. There is no doubt the manufacture of iron into plates, bars, and rods is small in comparison with what it would be if men would work; but some of the puddlers are at play for a rise of wages; this, in connection with the short supply of fuel, even when at work, will have a tendency to glut the market, as the make of pigs cannot be worked off, and will very likely interfere with the price. The preliminary meeting of the ironmasters was held on Thursday, at Dudley, when the price fixed for plates was 12*l.* 10*s.*, bars and rods, 11*l.* The price of pigs was kept in abeyance, each maker getting what he can, the price according to quality, ranging from 5*l.* 5*s.* to 6*l.* per ton.—*Wolverhampton Herald.*

Glasgow Pig-iron Trade.—Glasgow, January, 1. This being New Year's-day, business was entirely suspended, but yesterday the market closed firmly, sales of warrants being 74s. to 74s. 6d., mixed numbers. No change in bars.

Comparative Statement of the Scotch Iron Trade.

	1850.	1851.	1852.
Foreign shipments for the year . . .	194,576	192,676	224,070
Coastwise ditto	190,083	260,080	199,950
Total shipments . . .	324,659	452,756	424,020
Stock, December 31	275,000	350,000	450,000
Furnaces in blast, December 31 . . .	105	115	113
Price, December 31	45s.	37s. 6d.	73s.
Average price for the year	44s. 5d.	40s. 3d.	45s. 4d.
Make of malleable iron	80,000	90,000	90,000
Average price of bars, December 31 . .	£5 10s.	£5 7s. 6d.	£10 10s.

America.—By the United States mail steam ship *Arctic*, which arrived at Liverpool on Wednesday morning last, with advices from New York to the 25th ult., we learn that small sales of pig iron had been made at 29 dollars, six months; 50 tons refined bar, 73 dollars, six months. Common bars had been inactive. English sheets were firm at 4 cents to 5 cents. Sales of 500 packs Russia sheet iron had been made on terms not transpired. English refined iron 73 dollars to 75 dollars; common ditto, 62½ dollars to 70 dollars; boiler plate, first quality, 4 to 4 7·9.

Tunnelling of the Alleghany Mountain.—One of the tunnels on the Pennsylvania railroad now constructing, is to be 3,570 feet in length. Its area at the widest space within the lines of the masonry will be about 24 feet, and the spring of the arch will begin 16 feet from the crown of the arch. The arch itself of the tunnel will be rather of an oval form, one of the most beautiful curvatures which conic sections can afford. The greater part of the vast arched excavation will be inlaid with strong and substantial masonry. More than half of this masonry will be composed of sandstone well laid in hydraulic cement, and the remainder will be hard-burnt brick. This whole masonry will be 22 inches thick. The tunnel passes the Alleghany Mountain in Sugar Run Gap, and lies partly in Blair and partly in Cambria county. Taking into account the length of the tunnel and its interior breadth, and the quantity and solidity of its masonry, it may be regarded as the largest work of the kind in the United States. About 400 men are employed upon it. The contractors who are accomplishing this great work are J. Rutter and Son, perhaps the most eminent tunnel contractors in the country. They are men of untiring energy and of the utmost resolution, judgment, enterprise, and shrewdness, and withal gentlemen in every sense of the word.

Inventions in the New Crystal Palace.—The Directors, among their many arrangements, have determined to appropriate a portion of the building under the name of "Court of Inventions," where Inventors, Patentees, and others, may exhibit their inventions. The New Patent Law, by the principle of provisional protection from the date of application, gives Inventors great facilities for exhibiting and displaying their inventions, and taking advantage of this arrangement. — *Journal of the Society of Arts.*

The Steam Jet. — Mr. Goldsworthy Gurney's plan for Ventilating Mines by means of the steam jet is now receiving a severe testing at the hands of a Committee of the Society of Mining Engineers, established at Newcastle. Objection has been taken to this invention that with it, as well as with the ordinary furnace, there was great liability to fire the mine, especially when it was placed, as is most usually the case, at the bottom of the shaft, so as to obtain the advantage of a long column of heated air. Mechanical contrivances are found fault with as not being continuous in their action, causing pulsations in the current of air. Of this class Struve's pneumatic machine, or airometer, is perhaps the best, as it is stated to possess simplicity of action and capability of instant increased energy. There is a practical limit beyond which the exhausting process cannot be conveniently carried. It is now conceded that enlarging the air-passages, and splitting the air, on the "separation system," as it is called, is by far the better way of encountering the difficulty. Much may also be effected by a judicious system of mining arrangements, taking care that the upcast shaft is always sunk on the crop, so as to afford a natural vent for the light carburetted hydrogen, so injurious to the health and dangerous to the safety of the workmen.

BLOWING UP OF A CHIMNEY AT WARRINGTON.

The enormous chimney of the Chemical Works of the Messrs. Muspratt, at Warrington junction, was on Monday last blown up by gunpowder. Passengers by the London and North-Western Railway, who have had occasion to pass the junction, about twenty miles from Liverpool, have frequently been surprised at its enormous altitude and dimensions. It was 406 feet high; 46 feet diameter at the base; 17 feet diameter at the summit; contained 3,500,000 bricks, 3,500 tons in weight; and cost 7,000*l.* erecting. There was only one chimney higher in the United Kingdom. The one connected with the chemical works of Mr. Tenent, near Glasgow, was 20 feet higher; but it was a much less noble-looking shaft, inasmuch as it was narrower at the base, and contained about two-thirds less bricks. The works have not been in operation for about eight months, owing to arrangements being made to remove them to another locality. There being, therefore, no further use for the chimney, it was blown up under the superintendence of Mr. Stephen Court, engineer and architect of the St. Helen's Canal and Railway Company. A number of holes were delved round the base; and fourteen charges of gunpowder were inserted. At half-past 2 o'clock the train was fired. Nine charges exploded without any apparent damage being done to the stability of the shaft; but the report of the tenth had no sooner been heard than the chimney was rent from top to bottom, and the huge fabric fell, crumbling away gradually from the base upwards. The whole of the column fell nearly within the circumference of its own base. A dense cloud of lime-dust hid the ruins for a few seconds; but when it cleared away, the 3,500,000 bricks were perceived in the shape of a huge mound. A large crowd of spectators had assembled to witness the downfall. No accident of any kind occurred.

ELECTRO-MAGNETIC ENGINES.

Mr. Thomas Allan, of Edinburgh, the author of several ingenious applications of electricity to philosophical purposes, has, we understand, succeeded in producing an electro-magnetic machine, in which a great amount of power is created, at a small cost of materials for the battery.

The two points to solve in the use of electricity as a moving power are, its mode of application and its economy. The cost of batteries has generally been considered such as to render electricity useless as compared with steam; but this has arisen more from the misapplication of the power produced than from the necessary consumption of materials. The cost of materials is further reduced by the late improvements in batteries,—those lately patented by Mr. Roberts being considered comparatively costless, from the value of the chemical products being greater than the materials consumed.

It, therefore, now only remains to be shown that electricity,—the most powerful agent in Nature,—by an application in conformity with its known laws and properties, can be rendered applicable to the moving of machinery. If it can, it is needless here to enumerate the many material advantages it has over steam. There would be no reservoir of danger as in the steam-boiler; it would be always ready for action, without previous consumption of materials, as in getting up steam,—there would be no waste in freightage, as in carrying coal. As applied to navigation, more especially in long voyages, and in voyages to countries where coal does not exist, it would be invaluable; for it would at once reduce the cost of freight from the saving in tonnage, besides first cost; as vessels of half the size of our large ocean steamers would have the same carrying power, and therefore be more handy and less expensive in every way. As applied to railway locomotion, too, it would save the cost of coke; and locomotion on common roads would by this means fall within the range of practicability, from getting rid of the great dead weight and bulk to be carried. Its use in engines of small power would be very general, from its economy and simplicity of management.

Hitherto every application that has been put to a practical trial has been at variance either with the laws of electricity or mechanics; and hence a waste of 80 or 90 per cent. of the power used, rendering it impossible on such principles to form an engine on a large scale to act proportionately to a small one. In the plan now proposed by Mr. Allan, that waste is entirely obviated; the whole power of the current and of the battery consumption being applied to the machinery on the direct action principle, any amount of power, and any length of stroke, can be obtained.

Electro-motive power, coming as it does upon the wide and partly-beaten field of motive-power operations, becomes a question of great and even national importance; tending as it must to alter further the value of every article of commerce and manufacture.

We hope soon to have an opportunity of laying before our readers the result of experiments with Mr. Allan's engine, and before long to see it tried on the scale of

actual practice on one of our great lines of railway.

PHENOMENA OF THE EBBING AND FLOWING WELL IN GERMANY.

This remarkable well is the subject of extreme curiosity throughout Germany. At every hour of the day crowds surrounded the well, which is encircled by a proper guard, anxiously waiting the arrival of the mysterious phenomenon. Each person tries to detect its beginning, by fixing his eyes on the empty space in the shaft, the eleven or twelve feet depth of which, from the brim to the water, presents nothing but "darkness visible." On the black surface at the bottom, a gentle ripple is scarcely perceptible, produced by a few bubbles of gas; in other respects, all is still as the grave. Presently certain hollow sounds reach the ear, resembling the report of distant artillery, or drums, and the shaft is observed to fill slowly, by the water ascending like mercury in a thermometer, the surface becoming, at the same time, agitated and noisy. A thick foam covers it, which is only broken in the centre by a rapid succession of explosions of gas (almost carbonic acid), during which the water, where the foam is partially dispersed, assumes the green hue of the sea in high latitudes. In the meantime, the upward progress of the water, accompanied by great commotion, continues steadily, until the great shaft is filled to the brim with water, agitated in the most violent manner. To those who have looked down from the stern of a ship, hurried along by a gale through the sea, and have seen the water foaming against, and lashing the rudder, in perpetual leaps and contortions, it will afford some notion of the aspect of the moment here indicated; in short, a sailor is reminded of that very phenomenon. Or the well may be compared, in its extreme turbulence, to a great cauldron of water boiling on a furnace as rapidly as possible. When this turbulence is at its maximum, the emission of gas which preceded the ascent of the water in the well abruptly ceases, and, in a few seconds, the surface of the water in the shaft becomes perfectly tranquil; the water descends, and continues to do so, at first rapidly, and then more slowly, until it has subsided about nine or ten feet. This point has but just been reached, when a sudden swelling up of the water first, and then of the gas, is again observed at the bottom. The shaft fills very slowly, and the flow of water and gas continues for a long time progressively to increase, apparently not attaining their maximum until the water is at its full height, which requires from thirty to forty minutes after the first return of the stream. In this state of violent agitation it remains for about two hours, sometimes more, but often much less, when the preceding cycle of phenomena is repeated. The period of intermission varies considerably. In general that peculiarity has been observed every three hours, but its recurrence is greatly influenced by the number of pumps at work to extract the water from the well: the more pumps, the fewer periods of intermission.

"THE CYCLOPÆDIA OF USEFUL ARTS." EDITED BY CHARLES TOMLINSON. PART XXVIII.

George Virtue.

The high reputation which this admirably conducted work has achieved for itself for the minuteness of its details, and the freshness of its information on all the great manufactures and processes which it describes, is well maintained in the part before us. As a specimen of beautiful typography, also, and for the profusion of its wood engravings, executed in a high style of art, it has a strong recommendation beyond its mere literary merit. It has now gone as far as its twenty-eighth Part, which embraces the words "Mosaic" and "Organ." Within this range of subjects are several of the highest importance, and of interesting character, which are treated with much skill, and presented in so elegant and comprehensible a manner, as to be appreciated alike by the technical and the untechnical. To the latter, indeed, with the aid of the illustrations, the subjects treated of must be rendered perfectly clear; and we venture to say that even the superficial reader will acquire from the perusal of its pages an accurate knowledge of them, with very little effort the mind, while he would be certain to take a delight in tracing the progress of art down to the present era of its development. Foremost among the longest articles of the part, is one on the nail manufacture. In the entire range of the manufactures in iron, there is scarcely any that is more worthy of attention than that of nail-making, and the collateral one of needle-making,

which also finds a place in the part before us. Both of these receive from the Editor of the "Cyclopædia" the attention which their great importance and their magnitude deserve. The illustrations refer to the more prominent details of the manufacture, every step of which is perfectly described. At the same time that the general reader will derive instruction and pleasure from the perusal of these and similar articles, it must not be supposed that they are of so elementary a character that they may be passed over by such as have made mechanics their study. On the contrary, they are written with a full knowledge of the subject in its present state, and they exhibit clearly what has as yet been done, and what still remains to do. A highly interesting and copiously illustrated article on inland navigation, occupies a prominent place in this part, and will repay the attention of the reader. He will find the canal and lockage system popularly and fully described, and a few facts stated which may excite his surprise. The subjects of "Nitrogen," and of "Oils and fats," and "Olive oil" are also treated at considerable length. On account of the immediate bearing which both of them have on many of the arts of public and domestic life, they have very properly to be followed with their chemical and manipulative details. The most improved forms of apparatus at present in use, and the best results obtained, together with the prospects of the future improvement of both branches of manufacture, are fully and clearly exposed. The principles and construction of the Organ are illustrated and described in the last article of the part, which, however, is as yet not complete. This article in particular is invested with considerable interest, and will be read with pleasure. Upon the whole, we are disposed to regard this part as one of the mast interesting of the series, and it reflects the highest credit on its conductor.

ELECTRO TELEGRAPHIC DEVELOPMENT.

The extent of telegraphic communication completed and in operation throughout the world at the beginning of the present year may be estimated, as far as can be gathered from the returns, at nearly 40,000 miles. Of this amount there were nearly 4,000 miles in Great Britain, of which 100 miles only were underground, with about 400 or 500 miles in course of construction in England, Scotland, and Ireland, and as many more projected. In America there were 20,000 miles of telegraph completed and in operation, with 10,000 more in process of construction, uniting in one great network the principal cities of the United States, the Atlantic and Pacific Ocean, and the extreme boundaries of that extensive continent. In Europe there were about 11,000 or 12,000 miles of telegraph in operation, and as many more projected or in progress. In Germany there were 3,000 miles completed, in Austria 3,000, and in Prussia between 3,000 and 4,000 miles. France, until lately in the rear of other nations, is now extending her telegraphic lines in all directions, her completed mileage at the present moment being small compared with that of other countries, her principal communications being those between London and Paris, Strasburg, and Marseilles. Russia has just commenced her system of telegraphs between St. Petersburg, Moscow, and Cracow, and the ports on the Baltic and Black Seas. In addition to her existing line between Naples and Gaeta, Italy is continuing the Neapolitan line from Terracina to Rome, so as to connect with the lines of Upper Italy. Denmark has about 400 miles of telegraph. Belgium 500, and the Netherlands line has just been completed from Amsterdam to the Hague. About 4,000 miles are about to be constructed in India. Switzerland is introducing the instantaneous communicator, as well as other continental cities, so that the only unsupplied portions that will soon present themselves on a telegraphic map of the world will be Australia, Africa, and China.—*Advertiser.*

The Caloric Ship "Ericsson."—Again we are enabled to state, for the gratification of the public, that the machinery of the caloric ship *Ericsson* has been in motion. It was worked yesterday during ten consecutive hours, making over 6 revolutions per minute. The furnaces were intentionally worked upon a checked shaft. Only 420 pounds of coal were put into them during each hour, and upon this trifling quantity of fuel the fires continued to augment constantly during the day. We understand that the machinery will be worked for several days to come, and that the trial trip will not be made until the engines are in complete working order.—*New York Courier.*

NIXEY'S PATENT REVOLVING TILL.

An opportunity has been afforded us during the week of examining the operation of an extremely simple and useful contrivance, for which a patent has been obtained by Mr. Nixey, of Moor-street, Soho. The intention of this invention is to provide the means of protecting both the trader and his customers, in a rapid succession of payments over the counter, from the imputation of fraud or of error where no ground exists for it, and to fix the fraud or the error on the right party, when the transaction has not been fairly or correctly adjusted. For this purpose he has provided the "revolving till," described in his patent. It consists of a cylindrical box, about four inches deep, and six inches in diameter, which is either screwed down upon the counter, over the money-drawer, or else is let down flush with the counter itself. In either case the operation of the instrument is the same, and extremely simple and effective. A short upright axis supports a shallow circular tray in the top of this box, which is divided into six equal sectors by partitions. Each sector has a moveable bottom hinged upon the lower edge of the partition, and opening in the same sense. In general, these bottoms will be supported; but at one part of the revolution of the tray the bottom will give way, and that sector will discharge its contents through a hole in the counter, within this instrument, into the drawer below. Money paid by a customer is put into one of these sectorial compartments. A strong plate of plate-glass prevents both tradesman and customer from touching cash whilst in the tray, but the plate has a sector cut out of it corresponding in size and position with that of one of the sectors of the tray, to enable the money to be deposited in it. The money being placed in the open sector, the tradesman touches a small ivory handle connected with a simple escapement arrangement, and the tray is carried by a sudden movement through the sixth part of a revolution, thus bringing the money just paid in under the plate of glass, and, in fact, impounding it. Another open sector is now ready for the next payment, and the same operation being repeated with the handle, it is evident that five successive payments may thus remain in sight together, and sufficiently long to admit of the adjustment of any matter of dispute. At the next touch of the handle, the first sector spoken of is brought into the position where its bottom is no longer supported, and the money falls into the drawer below.

To comment upon the advantages of this ingenious instrument is quit superfluous. It is obviously one which the public as well as the tradesman are interested in introducing; and accordingly we are not surprised to hear that it is already launching out into a wide popularity. Mr. Nixey is now engaged in completing his arrangements for introducing another instrument by which light gold may be detected, and similarly kept in view.

The Steam Ship "Adelaide."—Plymouth, Tuesday.—This mail-packet sailed last evening for the Cape of Good Hope and Australia. On Sunday afternoon she was taken from Hamoaze into the Sound, with the intention of having her inspected by Captain Lowe, R.N., but the gallant officer, judging there was not sufficient light to make a satisfactory examination, postponed the important duty until yesterday; when, with Captain Henderson, the Company's marine superintendent, Mr. Scott Russell, her builder, Mr. Marshall, secretary, and others, she cruised round the Eddystone. Against a heavy swell and head-wind, when deeply laden, she made 10½ knots; she backed at the rate of 6 knots. In order to try her altered rudder she was put round twice to starboard and twice to port. The screw being disconnected, she was put under canvas only. In all these positions her performances gave great satisfaction, and whatever inconvenience may have been caused by the delay, her prospects for securing a successful voyage, after her thorough overhaul and repair, are greatly increased.—*Times.*

The Submarine Cable for Denmark.—It is stated that the submarine cable, 13 miles long, that was to be sunk across the Great Belt to Nyburg, has failed in its manufacture.—*Globe.*

Preparation of Liquid Glue.—Take 1 kilogramme of Cologne glue and dissolve it in 1 quart of water in a glazed pot over a gentle fire, or, better, in the sand-bath, stirring from time to time. When it is all melted, 200 grammes of nitric acid at 36° are added, by small quantities at a time. Effervescence takes place, from the disengagement of hyponitric acid. When all the acid has been poured in, the vessel is removed from the fire, and allowed to cool. Glue thus prepared has been kept for upwards of two years, in an uncorked bottle, without suffering any change. Liquid glue is very convenient in various chemical operations. Pieces of linen covered with it may be used as a luting for preserving certain cases. It is likewise very useful to cabinet-makers, carpenters, pasteboard-makers, and toy-makers, since it does not require heating.—*The Artizan.*

The Dutch Electric Telegraph.—The Electric Telegraph, constructed between La Haye and Brussels, and between La Haye and Scheveningen, has been opened to the public.—The works of the submarine telegraph between Holland and England are on the point of being commenced. The telegraph will run from Scheveningen to Lowestoft, and not to Harwich as originaliy decided. Mr. Window is the engineer.—*Civil Engineer and Architect's Journal.*

Victoria Bridge, Glasgow.—Victoria-bridge was inspected on Friday by James Walker, Esq., from whose plans and those of his partner the structure has been erected. The bridge, only four days after the arch was keyed, was subjected to the severest trial which any similar structure has withstood on the Clyde for the last twenty years—the flood on Monday last submerged the piers, and stood 6 inches into the springing of the arches, but though the centres are still all attached, everything stood nobly.—*North British Daily Mail.*

Ice-Saws.—Models of ice-saws, with improvements suggested by Mr. Abernethy, have just been completed at the factory at Woolwich Dockyard, by order of the Lords of the Admiralty. Mr. Abernethy was with Commander Inglefield in his recent voyage to Smith's and Jones's Channels, in the *Isabel*, and with Captain Sir James Ross, as ice-master, in the *Enterprise*, and was four years absent with Rear-Admiral Sir John Ross, when he was wrecked in the Arctic regions; and his long experience enables him to judge of the best description of saws for making way through the ice of the polar regions.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JANUARY 8, 1853.

THOMAS BAZLEY, of Manchester, cotton spinner. *For improvements in machines for combing cotton, flax, silk, and other fibrous materials.* Patent dated June 24, 1852.

In Mr. Bazley's improved combing machine the sliver of fibrous materials is fed to the combing drum between gill-combs, which bring it to a suitable position to be laid hold of by the passing combs as the drum revolves. The drum has an intermittent motion, moving quickly through one-twelfth of a revolution (where twelve combs are arranged round its periphery), and then remaining at rest, in order to permit the portion of wool being fed on to one of the combs to be well laid on, and the portion about to be removed to be drawn off on to a doffer cylinder. At this time an arrangement of nippers or holders also comes into operation, to cause the detached portion of sliver fed on to the comb to be drawn or elongated, when the drum again begins to revolve, and the long fibres of the combed portion in course of removal to be drawn out and properly pieced on to the doffer, while the short fibres left on the combs are removed by a rotary brush previous to the combs again coming into operation.

A similar arrangement may be also adopted in other combing machines, such as Lister's, &c.

Claims.—1. The combination of machinery described for combing cotton, flax, silk, and other fibrous materials.

2. The application of the drum and holding arrangements to combing machines.

GEORGE PEARSON RENSHAW, of the Park, Nottingham, civil engineer. *For improvements in cutting and shaping.* Patent dated June 24, 1852.

These improvements consist in combining into one complete system several tools or machines of ordinary and improved construction, so as to enable operations of cutting, boring, turning, slotting, and shaping hitherto performed in isolated machines to be conducted continuously.

The claims embrace the several arrangements of machinery shown and described.

JEAN BAPTISTE GEORGE LAUDET, of Paris, civil engineer. *For certain improvements in locomotive engines, part of which improvements are also applicable to other engines.* Patent dated June 24, 1852.

Mr. Laudet's locomotives are so arranged as to combine in themselves engine and tender, thus enabling the use of independent vehicles for the supply of coke and water to be dispensed. They have either vertical or horizontal tubular boilers, and are in addition furnished with subsidiary arrangements for governing the supply of water to the boiler and steam to the cylinder, and for indicating the amount of distance travelled over. An improved arrangement of grease-box is also described, and a new construction of wheel-bearings made of tempered cast iron, in order to enable them to resist friction.

JOSEPH MORGAN, of Manchester, patent candle-machine manufacturer, and PETER GASKELL, of the same place, gentleman. *For improvements in the manufacture of candles.* Patent dated June 24, 1852.

The patentees describe and claim:

1. An improved mode of constructing of the moulds of Morgan's patent candle machines, and other moulds in which the nozles slide in the interior, so as to make the nozles capable of closing on and retaining the wicks when they reach the end of the mould.

2. The use of enamelled iron tubes for making the moulds.

3. An arrangement of apparatus for attaching loops to candlewicks.

JOHN McCONOCHIE, of Liverpool, engineer. *For improvements in locomotive and other steam engines and boilers, in railways, railway carriages, and their appurtenances: also in machinery and apparatus for producing part or parts of such improvements.* Patent dated June 24, 1852.

This invention embraces a variety of important improvements under the several heads specified in the title. We propose to lay before our readers a full description of some of these at a future period.

JAMES EDWARD McCONNELL, of Wolverton, civil engineer. *For improvements in steam engines, in boilers, and other vessels for containing fluids, in railways, and in materials and apparatus employed therein or connected therewith.* Patent dated June 24, 1852.

Mr. McConnell describes and claims:

1. A method of surcharging or superheating steam after its exit from the boiler, and before its introduction into the cylinder of locomotive engines.

2. A mode of constructing wrought iron railway wheels with tubular spokes.

3. A mode or modes of constructing steam-engine pistons of certain peculiar forms and combinations of metals, in order to prevent adhesion of the contact surfaces.

4. A mode of constructing the cylinders, cylinder covers, and valve covers of steam engines of wrought iron.

5. A mode of constructing boilers and vessels for holding and containing fluids of sheet metal, protected on one or both sides by a covering of copper or brass, or other anti-corrosive metal.

6. A mode of constructing the permanent way of railways, when longitudinal bearings and saddle rails are used, the same connection which secures the rail to its bearer being employed also as the fastening for the ends of the tie-rods.

7. A mode or modes of constructing hollow axles of tubular metal, and also piston rods, connecting rods, and shafts and other details of railway machinery.

THOMAS ALLAN, of Edinburgh, engineer. *For improvements in producing and applying electricity, and in apparatus employed therein.* Patent dated June 24, 1852.

We propose to give a description of Mr. Allan's improved apparatus, with engravings, in a future Number.

JOSEPH SWAN, of Glasgow, engineer. *For improvements in the production of figured surfaces, and in printing, and in the machinery or apparatus used therein.* Patent dated June 24, 1852.

The improvements in the production of figured surfaces are carried into effect by the employment of a peculiar construction of pantagraphic apparatus, which consists of a balanced rod suspended in a vertical framework, by means of a universal joint at about the middle of its length, which allows it to be moved sideways in either direction but without revolving around its axis. At the lower extremity of the rod is attached a horizontal arm which carries a tracer, and at the upper extremity is another horizontal arm capable of adjustment, which is furnished with a graver or cutting-tool. Each of these arms works to and fro over horizontal tables which carry the pattern surface and the surface to be engraved, and by moving the tracing point over the pattern a similar design will be produced, either on an enlarged or reduced scale, on the surface to be figured.

The "improvements in printing" have relation to lithographic presses, and consist in arranging one or more of such presses in connection with a suitable prime mover, so that it or they may be readily connected with, or disconnected from, the driving shaft and the working of the presses be performed continuously.

MATTHEW AUGUSTUS CROOKER, engineer, of New York. *For certain improvements in paddles for steam vessels.* Patent dated December 28, 1852.

For a description of this invention, see *ante*, p. 1.

THOMAS HOBLYN, of White Barns, Hertford, esquire. *For certain improvements in the art of navigation.* Patent dated December 28, 1852.

A description of Mr. Hoblyn's improved instruments will be found at another part of our present Number (*ante*, p, 21).

CHARLES JAMES WALLIS, of Clarendon-chambers, Hand-court, Holborn, civil engineer and mechanical draughtsman. *For improvements in machinery for crushing, pulverizing, and grinding stone, quartz, and other substances.* Patent dated June 24, 1852.

In this improved machinery the crushing or pulverizing effect is produced by balls, spheres, or wheels rotating in a circular groove in which the materials to be operated on are placed. The spheres or balls are set in movement by contact with an upper plate, which is also grooved to correspond with the lower one. The alternate balls or spheres should be of slightly less size than the others in that series, in order to prevent their being brought into contact while working, and thus impeding the operation of the apparatus.

Claim.—The mode or modes of working balls, spheres, or wheels in grooves between tables or plates, for the purpose of crushing, pulverizing, and grinding stone and other substances.

PROVISIONAL PROTECTIONS UNDER THE NEW LAW.

Dated December 6, 1852.

979. William Quarterman. Eliciting the gas concentrated in nitre and sulphur, and which is entitled a gaseous engine.

Dated December 8, 1852.

993. Peter Armand le Comte de Fontainemoreau. Improvements in the machinery for applying metallic capsules. A communication.

Dated December 15, 1852.

1060. William Edward Middleton. A new or improved lubricator. A communication.

1061. Philippe D'Homme. Certain improvements in the manufacture of window-blinds, curtains, and hangings. A communication.

1062. Susan Walker. Improvements in clogs and pattens.

1063. George Elliot and William Russell. Certain improvements in boiling down saline solutions.

1064. Jean François Isidore Caplin. Improvements in apparatus for preventing or curing a stooping of the head or of the body.

1065. John Mason. Improvements in the processes of bleaching and dyeing textile materials and fabrics.

1066. Alexander Rotscheff. Improvements in machinery or apparatus for separating gold or other valuable substances from earth or other extraneous matters. Partly a communication.

1067. Charles James Wallis. Improvements in machinery for amalgamating, mixing, and grinding substances together.

1068. Anthony Norris Groves. Improvements in apparatus for heating, drying, and evaporating.

1069. Richard Taylor, junior, and John Arthur Phillips. Improvements in treating zinc ores.

1070. Clement Dresser. Improvements in combining materials to be used in substitution of whalebone and other flexible and elastic substances. A communication.

1071. Thomas Dunn, Hugh Greaves, and William Watts, junior. Improvements in machinery and apparatus for altering the position of engines and carriages on railways.

Dated December 16, 1852.

1072. Peter Armand Lecomte de Fontainemoreau. An improved lamp, which he calls "lamp omnibus." A communication.

1073. André Cointry. Improvements in the manufacture of bread and biscuits.

1074. John Jeremiah Payne. An improved axle in two parts, applicable to railway and every other description of carriages and vehicles, both public and private.

1075. Charles Barlow. Improvements in bleaching, purifying, and concentrating sulphuric acid, parts of which invention are applicable to evaporating other liquids.

1076. John Healey. The application of glass and enamel to the flyers and other parts of machinery used in the preparing, spinning, doubling, winding, warping, dressing, and weaving of cotton, wool, flax, silk, and other fibrous materials.

1077. Richard Blades. Certain improvements in the method of cleansing sewers and drains, and in the machinery or apparatus connected therewith.

1078. James Stevens. Improvements in grinding and polishing lenses.

1079. Francis Charles Knowles. Improvements in the manufacture of iron.

1080. Thomas Motley. Improvements in constructing the tablets, letters, and figures for indicating the names, designations, or numbers of streets, houses, buildings, and other places.

1081. Auguste Edouard Loradoux Bellford. A new system of stoppering bottles and other vessels. A communication.

1082. Archibald Slate. An improvement in propulsion.

1083. Archibald Slate. Improvements in the production of motive power from elastic fluids.

1084. Archibald Slate. Improvements in propelling vessels.

1085. James Dunlop. Improvements in saddles.

1086. George Michiels. Improvements in the manufacture and purification of gas.

1087. George Sands Sidney. Improvements in jugs or vessels for containing liquids.

Dated December 17, 1852.

1088. Henry Kenyon. Improvements in machinery for grinding bones and other substances.

1089. Frederick Joseph Bramwell. Improvements in steam engines.

1090. Archibald Slate. Certain improvements in the arrangements for working the slide valve for the induction and eduction of fluids.

1091. Archibald Slate. An invention in steam-boilers.

1092. Robert William Billings. Improved apparatus for ventilating chimneys and apartments.

1093. William Wilkinson. Improvements in the manufacture of looped-pile and cut-pile fabrics, and the machinery employed therein.

1094. Alfred Krupp. Improvements in cannons.

1095. John Filmore Kingston. Improvements in obtaining reciprocating motion, and in propelling and steering vessels.

1096. James Langridge. Improvements in the manufacture of stays.

Dated December 18, 1852.

1097. Joseph Matthews. A burglary alarm.

1098. George Thomson. A machine for cutting wood.

1099. Thomas Young Hall. Improvements in safety lamps.

1100. William Robertson. Improvements in certain machines for spinning and doubling cotton and other fibrous substances.

1101. Thomas Elliott. Improvements in steam-engines, which are also applicable to pumps.

1102. Joseph Alexander Westerman. Improvements in the carbonization of turf, and the manufacture of paper and fuel therefrom.

1103. Edward Schischkar. Improvements in dyeing and colouring yarns and textile fabrics.

1104. Edward Schischkar. Improvements in colouring or staining yarns and textile fabrics.

1105. Charles Constant Boutigny. Improvements in distillation, and in the apparatus employed therein.

1106. John Clay. Improvements in the manufacture of coal gas.

1107. William East. Improvements in machinery for crushing clods, for dibbling and drilling land, and sowing seeds.

Dated December 20, 1852.

1109. Jean Durandeau. Certain means of obtaining marks and designs in paper.

1110. George Lingard. Improvements in taps, and apparatus connected therewith, for admitting air to beer and other liquors under draught.

1111. William Wilkinson. Improvements in the manufacture of paper and pasteboard, and in the production of a substance applicable for veneers, panels, and to many purposes to which gutta percha and papier maché are applicable.

1112. Peter Armand Lecomte de Fontainemoreau. An improved mode of constructing night-stools and utensils, water-closets, urinaries, and other recipients of fecal matters, also applicable to apparatus for containing fluids, liable to or in a state of decomposition. A communication.

1114. Charles Watson. Improvements in carriage and stable-brushes.
1115. William John Silver. Improvements in giving motion to capstan and other barrels.
1116. George Gwynne, and George Fergusson Wilson. Improvements in the manufacture of candles, night-lights, and soap.

Dated December 21, 1852.

1118. Ferdinand D'Albert. A certain chemical combination for replacing indigo, which he calls "D'Albert blue."
1120. Jean Baptiste Moinier and Charles Constant Boutigny. Improvements in distilling fatty matters.
1122. John Akrill. Improvements in the manufacture of bricks, tiles, and other earthenware articles.
1124. John Akrill. Improvements in the manufacture of crucibles.
1126. William Edward Newton. Improvements in lamps, and in apparatus to be used therewith. A communication.
1128. Ephraim Mosely. Improvements in the manufacture of artificial masticating apparatus.

Dated December 22, 1852.

1130. Alfred Vincent Newton. Improvements in the means of urging the fires, and increasing the draught of furnaces, and in arresting the sparks given off from the chimneys of locomotive engines. A communication.
1132. Frank Clarke Hills. Improvements in purifying gas.
1134. John Filmore Kingston. Improvements in obtaining motive power by electro-magnets.
1136. Thomas Greenshields. Improvements in the manufacture of alkali.
1138. Thomas Vicars the elder, and Thomas Vicars the younger. Improvements in baking-ovens and apparatus for placing the bread, biscuits, or other articles to be baked therein.
1140. John Moore Hyde. Improvements in steam-engines, and the production of steam for the same.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 4th,* 1853.)

560. Arthur Ashpitel and John Whichcord, the younger. Certain improvements in cocks, valves, and fire-plugs.
611. Robert William Sievier. Improvements applicable to the manufacture of hats, caps, and bonnets, or other coverings for the head.
650. James Wotherspoon. Improvements in the manufacture or production of confectionary, and in the machinery, apparatus, or means employed therein.
757. Thomas Taylor. Improvements in apparatus for measuring water and other fluids, which apparatus is also applicable to the purpose of obtaining motive power.
788. William Williams. Improvements in electric telegraphs.
798. Jean Joseph Jules Pierrard. Improvements in preparing wool and other fibrous substances for combing.
903. William Pink. Improved construction of stirrup-bar for saddles.
1003. Sir John Powlett Orde. Improvements in head-gear for horses and other like animals.
1004. Joseph Hopkins. Improvements in obtaining a straight line parallel to the axis of the earth, or in rendering the axis of a tube or of a telescope parallel thereto.
1010. Edmund Hunt. An improved screw-propeller.
1028. Archibald White. Improvements in apparatus for retarding and stopping railway trains.
1053. Isham Baggs. Improvements in obtaining or extracting gold and silver from their ores.
1063. George Elliot and William Russell. Certain improvements in boiling down saline solutions.
1068. Anthony Norris Groves. Improvements in apparatus for heating, drying, and evaporating.
1069. Richard Taylor, junior, and John Arthur Phillips. Improvements in treating zinc ores.
1070. Clement Dresser. Improvements in combining materials to be used in substitution of whalebone and other flexible and elastic substances.—A communication.
1086. George Michiels. Improvements in the manufacture and purification of gas.
1087. George Sands Sidney. Improvements in jugs or vessels for containing liquids.
1093. William Wilkinson. Improvements in the manufacture of looped-pile and cut-pile fabrics, and the machinery employed therein.
1096. James Langridge. Improvements in the manufacture of stays.
1097. Joseph Matthews. A burglary alarm.
1100. William Robertson. Improvements in certain machines for spinning and doubling cotton and other fibrous substances.
1103. Edward Schischkar. Improvements in dyeing and colouring yarns and textile fabrics.
1104. Edward Schischkar. Improvements in colouring or staining yarns and textile fabrics.
1105. Charles Constant Boutigny. Improvements in distillation, and in the apparatus employed therein.
1108. Juan Nepomuceno Adorno. Improvements in the manufacture of cigars, cigarettes, and other similar articles.
1113. Charles Pilkington, Thomas Pilkington, and Abraham Pedigor. An improved joiners' brace.
1115. William John Silver. Improvements in giving motion to capstan and other barrels.
1116. George Gwynne and George Fergusson Wilson. Improvements in the manufacture of candles, night-lights, and soap.
1120. Jean Baptiste Moinier and Charles Constant Boutigny. Improvements in distilling fatty matters.
1126. William Edward Newton. Improvements in lamps, and in apparatus to be used therewith. —A communication.
1130. Alfred Vincent Newton. Improvements in the means of urging the fires, and increasing the draft of furnaces, and in arresting the sparks given off from the chimneys of locomotive engines.—A communication.
1136. Thomas Greenshields. Improvements in the manufacture of alkali.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

1185. Francis Alton Calvert. A universal ratchet drill. (Communication.) December 28.

WEEKLY LIST OF PATENTS UNDER THE PATENT LAW AMENDMENT ACT, 1852.

Sealed Jan. 5, 1853.

40. Frederick Richard Holl.
59. Marcus Davis.
127. Robert W. Parker.
160. Joseph Burch.
184. Joseph Needham.
191. John Stringfellow.
192. George John Philps.
195. George Stuart.
206. John Moseley.
297. Alfred Kent.
338. Robert Lambert.
392. Joseph Burch.
393. John Gedge.
399. Joseph Hopkinson.
400. Simon Pincoffs and Henry Edward Schunk.
415. William Beckett Johnson.
419. John Henry Johnson.
441. John Kealy.
474. William Weild.
554. John Collis Browne.
570. Martin Watts.
582. James Sinclair.
645. Peter Fairbairn.
646. George Fife.
662. Peter Fairbairn and John Hargrave.
719. Sir Charles Fox.
726. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
1853: Jan. 4	3405	Webb and Greenway	Birmingham	Bolt.
,,	3406	Charles Eyland	Walsall	Belt-fastening.
5	3407	Charles Eyland	Walsall	Belt-fastening.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

1852: Dec. 31	486	James Gurrin.	Norwich	Wellington shoe.
1853: Jan. 1	487	Louis Martin	Tenison-street, York-road	Rest-head or bridge for billiard-queues.
4	488	John Simmons	Mile-end-road	Face of mill-stones.

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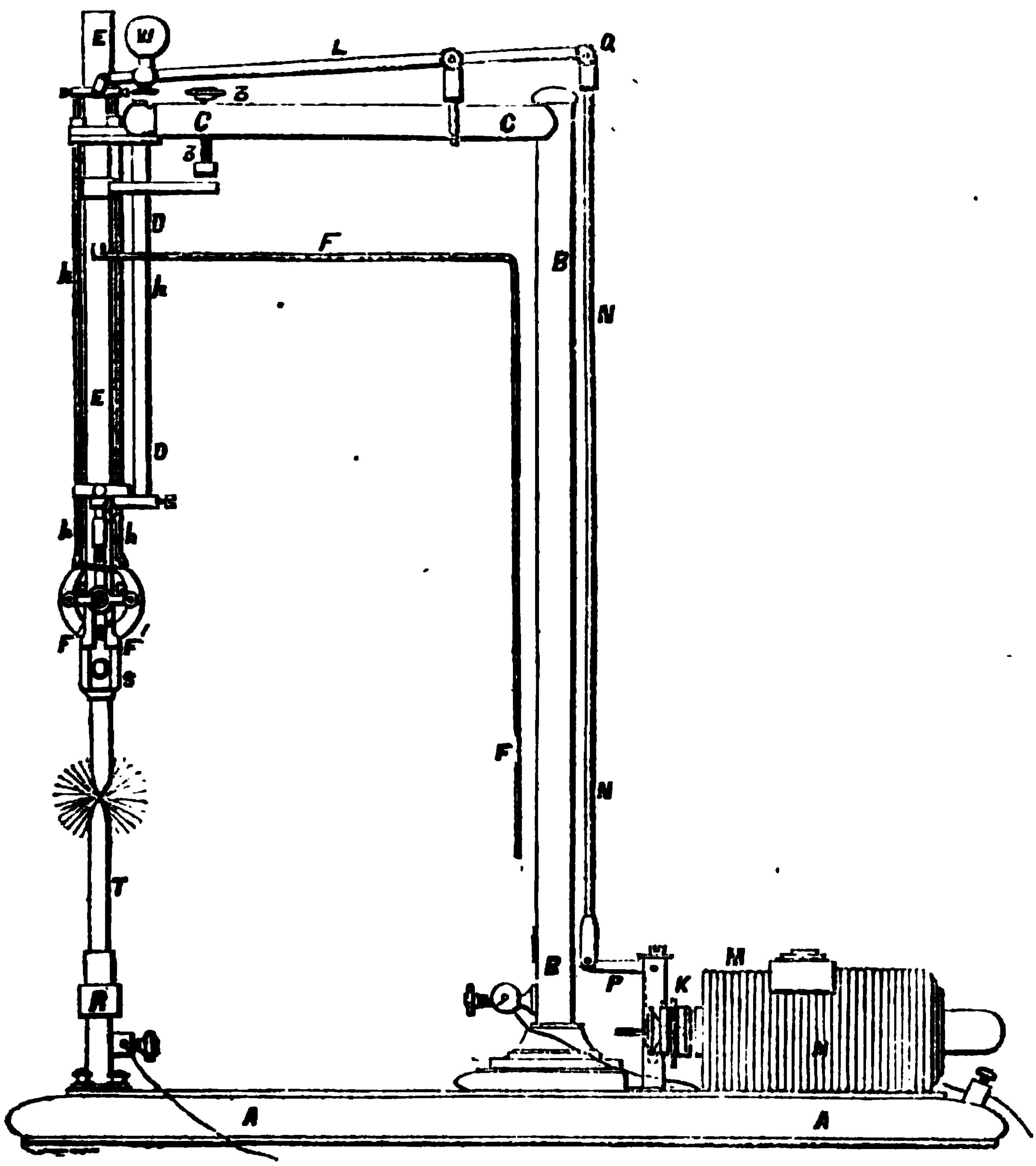
Mechanics' Magazine.

No. 1536.] SATURDAY, JANUARY 15, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

ROBERTS' PATENT ELECTRIC LAMP.

Fig. 1.



ROBERTS' PATENT ELECTRIC LAMP.

Patent dated July 6, 1852. Specification enrolled January 6, 1853.

Among a variety of important applications of electricity to which Mr. Roberts' patent is directed, one of the most useful is an improved electric lamp. The great difficulty of regulating the distance between the electrodes has hitherto proved a barrier to the extensive introduction of the invention for public and domestic purposes, and it has for many years engaged the attention of men of science. Mr. Roberts has already done much towards the general use of electricity by pointing out the means of obtaining large supplies of the electric fluid at small cost; and, in the ingenious arrangement by which he has surmounted the inherent difficulty of the lamp, to which we have adverted, and which we are about to describe, he has rendered great service in the cultivation of this branch of experimental philosophy.

The mode in which Mr. Roberts effects the permanent separation of the electrodes at the proper distance—usually termed the "striking distance"—is, to arrange the apparatus carrying one of the electrodes in such a manner that that electrode shall be released from the apparatus, and allowed to fall until its point comes in contact with the other electrode, and then be again taken hold of by the apparatus within which it is placed. This having been effected by means of another arrangement of the apparatus, either in connection with the same or with the other electrode, one of the electrodes is drawn back until the points of the two electrodes shall be the proper and regulated distance from each other, as above described. The apparatus for producing these effects may be actuated either by an electric current or by clockwork.

The electrical arrangement is shown in the figure. A A is a board or stand, on which an upright pillar B, of brass, about one inch in diameter and eighteen inches high, is firmly secured. The pillar is bent at top into a right angle, forming a projecting arm C, of about eight inches long; to this is soldered the rod D, about six inches long, which forms a support and guide for the tube E, which is three-eighths of an inch internal diameter, and about twelve inches long. E is furnished with two pins *x* which slide in guide-holes *o*, and by these it is made susceptible of a vertical motion when made to slide up and down. The tube is in metallic connection with the pillar B by means of the flexible metallic strap F, for the purpose of conveying electricity to it from a galvanic battery. The tube E contains a "graphite" or carbon electrode, which electrode is of from eight to twelve inches in length, or longer, if convenient, and of such a diameter as to slide freely within the tube E, and yet not to fit so loosely as to fail to be pressed by the spring mouth-piece S, which mouth-piece is a segment of the mouth of the tube E, furnished with a long spring S, so far removed from the extremity of E that the heat of the incandescent graphite shall not injure it. The use of this spring mouth-piece is to press against the electrode, and effect a metallic contact between it and the tube, for the certain conveyance of electricity to the electrode, and, for further ensuring this, the mouth-piece is lined with platina; but the mouth-piece does not press against the electrode so forcibly as to prevent the graphite sliding through it, either by its own weight, or, better, by aid of a spring or small additional weight placed behind. Thus the electrode would always fall through the tube E, were it not supported in it by the pressure of two jaws or "clips" F^1 F^1 working on joints or hinges G G—the ends of these clips entering through two slits into the interior of the tube E, and pressing so firmly (when in action) upon the electrode as to prevent its sliding, and keep it securely in its place. The clips are actuated by two rods as handles *h h*, reaching to the top of the tube E, and there connected by a joint with a lever L. If the other end of the lever be depressed, it draws up the handles *h h*, and the clips bite inwards upon the graphite or other electrode within the tube. The lever L at the end Q is united by a joint to a rod N, which is attached to a bell-crank P; the other limb of the bell-crank is fixed to the keeper K of the electro-magnet M. This electro-magnet is of the usual kind, viz., a bar of soft iron in the horse-shoe form, wound round with a coil of covered copper wire, which forms part of the

electric channel or circuit from one pole of a galvanic battery to the other. One end of this coil is soldered to the pillar B, the other has a binding screw for the purpose of attachment to the wire leading to the positive pole of a powerful galvanic battery. On the base or stand A, and vertically under the tube E, is a socket R, for the purpose of holding another graphite electrode T; and the socket, by means of a binding screw, can be placed in metallic contact with a wire from the negative pole of the galvanic battery. By three slots and screws the socket and its electrode can be so adjusted as to bring the points of the electrodes in exact contact with each other.

Let us suppose the lamp now ready for action—one graphite electrode in the socket R, another dropped into the tube E; the clips being open by reason of the balance weight *w* on the end of the lever L depressing it and forcing them open, the electrode in E slides through until its point comes into contact with that in the socket R. If the lamp be now put in connection with the battery, the electricity circulates round M, making this a powerful magnet, and attracting the keeper K, which draws down the lever L, and raises the handles of the clips *h h*. The clips seize on the electrode within the tube, holding it firmly, while the further depression of the lever L lifts up the tube E until stopped by the adjusting screw Z, generally for the distance of one thirty-secondth of an inch. While this is taking place, the electricity circulates from the coil round M through the pillar B, the strap F, the metal of the tube E, to the electrode within it. This electrode has now been raised by the lever L, as described, one thirty-secondth of an inch, and consequently so far separated from the electrode in R, and the electricity passes from the point of the electrode in E to that in R, giving an intense light; from R it circulates, by means of a wire, to the other end of the battery. In the meantime, the electrodes gradually waste away until a time arrives when the distance between the points of the electrodes is too great for the electricity to surmount or pass through. As soon as this occurs, the current of electricity ceases, M is no longer a magnet, the keeper is released, the lever L, by means of the balance weight W, is depressed at the end in connection with the clips of the tube E, and descends its allotted space; the clips open, and the electrode in E is free to slide downwards, which it does until it comes into contact with the electrode in R. The instant this contact takes place the circuit is again complete, the current of electricity circulates, and the same action, with the evolution of a brilliant light, takes place, until, by another wasting of the electrodes, the same change ensues; and this is repeated again and again until all the electrode is destroyed.

BESSEMER'S SUGAR-REFINING APPARATUS.

On Monday last, a series of experiments were performed with Mr. Bessemer's Patent Sugar-refining Apparatus, in the presence of several gentlemen connected with the sugar trade in Liverpool, Southampton, and London. These gentlemen assembled at Baxter-house, Old St. Pancras-road, for the purpose of witnessing the operation of the apparatus, which accomplishes objects of great importance in the economy of the sugar manufacture. One of these consists in carrying off the aqueous matter of the sugar, by bringing it into contact with a current of air moving at a high velocity, thus dispensing with the boiling process: and another is the removal, by a simple process, of the external discoloration by treacle, which so much lessens the value of raw sugar.

These improvements constitute a great advance of the manufacture, which has long laboured under disadvantages from the incidental consequences of the existing mode of practice. A variety of circumstances have contributed to keep this particular art far behind others in the march of progress. In particular may be pointed out the want of that powerful incentive to improvement which unrestricted competition so invariably supplies, and the mystery with which those engaged in the trade surround their operations. Not only have strangers been carefully excluded from the works where sugar is refined, but we have been assured that the head sugar-boiler refuses permission even to his employer to see taken the final proof of his syrup.

Previous to the year 1813 the most crude and unscientific mode of boiling sugar was then practised. At this period the Hon. Edward Howard introduced the celebrated "Vacuum Pan." This improvement en-

countered the most determined opposition, the entire trade, with the single exception of Mr. Hodgshen, refusing to use it. So great, however, was the merit of the discovery, that those who first laboured for its exclusion were ultimately glad to use it, and pay a royalty of half a crown per cwt. on the sugar refined, from which source the patentee realised 70,000*l.* in a single year.

After this the trade again reposed until 1824, when Messrs. Derosne and Cail introduced the Charcoal Filter. Another struggle against improvement ensued, but this most valuable French discovery eventually was adopted, and is now used by every refiner in Europe.

After another long interval, we now again arrive at a new effort of invention.

From the earliest period in the history of refining, down to the present time, the water used in dissolving sugar had afterwards to be separated from it by boiling; although it was long known that this process was highly destructive to sugar by darkening its colour and converting it into treacle. Howard's great improvement, which was designed to remedy this evil, consisted in boiling the sugar *in vacuo*, because the temperature required in that mode of operation was much less than that required in the open air. At first sight it would appear that so simple a means of separating the water offered no great scope for improvement, but the importance of some further step in advance may be recognised when it is considered that in London alone, 8,000 tons of sugar are annually converted into treacle by this boiling process, which at the same time involves a consumption of 2,200 tons of coal.

In Mr. Bessemer's process the boiling is entirely dispensed with, the aqueous portions of the dissolved sugar being separated by bringing it in contact with a rapid current of dry air. This is made to sweep over the surface of the fluid, which is taken up upon revolving plates of metal surrounding a hollow perforated cylinder, and exposing to atmospheric action a surface of from 15,000 to 20,000 square feet. The evaporation of 4,000 lbs. of water per hour is effected in a vessel of only 14 feet by 6—a quantity at least four times as great as is boiled off in an ordinary steam-boiler of the same dimensions. By this simple and inexpensive mode of evaporation, the white syrups are concentrated without producing the faintest shade of discolouration, while at the same time not a particle of sugar is converted into treacle.

By the other process above adverted to, crude Colonial sugars are cleansed and improved in quality to the extent of 6s. or 8s. per cwt. with great rapidity. The dark brown colour of raw sugar is due to an external coating of treacle which discolours each crystal, and gives it that peculiar coarse flavour so well known. Mr. Bessemer conceived the idea of washing off this coating with pure water without dissolving the sugar. The crude Colonial sugar, in an almost semi-fluid state, is spread by the machine in a thin stratum on a circular wire gauzé, and a partial vacuum having been made underneath by means of an air-pump, the table rotates under a series of fine jets of water, which pass through the sugar with the great velocity with which, it is well known, water enters a vacuum. All the dirty brown molasses is thus removed instantaneously, leaving a pure and nearly white sugar, which, by the rotation of the table, is delivered into a hogshead, while the surface is recharged, and a continuous action preserved. A table of 4 feet in diameter can thus operate on 3 tons of sugar per hour. About 80 per cent. of this improved article is obtained in a dry state, the remainder, which is in solution, is in a condition for being refined in the ordinary way. Some of the samples washed were estimated, by a refiner, who witnessed the operation, at 10s. 6d. per cwt. extra value. The cost of the process is said not to exceed 1½d. per cwt.

INSTITUTION OF CIVIL ENGINEERS.

At the usual weekly meeting of the Institution of Civil Engineers, held on Tuesday evening last, James Meadow Rendel, Esq., president, in the chair, the following paper was read: — "On the Nature and Properties of Timber, with notices of several methods now in use, for its preservation from decay," by Mr. Henry Potter Burt, Assoc. Inst. C. E.

The author first examined the different species of home and foreign-grown timber, their various properties, uses, tendencies to decay, under certain circumstances, the most apparent causes of dry rot, the formation of fungi, and the action of wet and of heat; noticing the extraordinary duration of specimens of timber found in Egypt, in the ruins of Nineveh, and in the more recent monastic and castellated edifices of this country.

The chemical constitution of wood was examined, in order to trace the origin of decay, and to lead to the consideration of the most efficient means of arresting it. The necessity for some efficacious and yet moderately cheap system of preserving timber, was insisted on, from the great demand for railway and other engineering works, not only in Europe, but even in the East Indies; where it was remarkable, that the

wood which would resist the climate and the ravages of the white ant, was only to be found at such distances inland, that the expense of carriage, in a country devoid of good means of communication, rendered it more economical to buy fir-timber in the north of Europe, convert to the required dimensions, and saturate it with creosote in England, and convey it by sea to India, for the use of the railway now in course of construction in that country.

The earliest record of preserving animal and vegetable substances were traced back to the Egyptians, whose mummies were embalmed by being boiled in pitch, found floating in the lakes; the linen and the timber, so preserved, gave the first idea for adapting the process to the wants of the present period, and several of the patents granted were enumerated and commented on; the greatest space being devoted to those of

Kyan, for chloride of mercury;
Burnett, for chloride of zinc;
Margary, for acetate, or sulphate of copper;
Payne, for the use of two solutions in succession, mutually decomposing each other, and forming an insoluble substance in the pores of the wood;
And Bethell, for creosote, or oil of coal-tar;—

Which last had, by its extensive employment in harbour, railway, and other engineering works, proved, that when properly executed, the preservation of the timber from decay and from the ravages of insects, might be considered complete.

The discussion was commenced, but was adjourned until Tuesday evening, January 18th, at 8 p.m.; when, if the time permitted, the following paper was announced to be read; "On the construction of Fire-proof Buildings," by Mr. James Barrett, Assoc. Inst. C. E.

LORD JOHN RUSSELL AND THE LEEDS MECHANICS' INSTITUTION.

The recent *soirée* of the Leeds Mechanics' Institution, which Lord John Russell distinguished by his presence in the Chair, will henceforth be gratefully kept in the memory of its members by the gracious act of Lady Russell, who has presented to the Institution the portrait of her illustrious husband, accompanied by the very kind expression of feeling quoted in the following letter from the Right Hon. M. T. Baines, M.P., to the President of the Institution, Mr. James Kitson:

"*Headingley, Jan.* 3, 1853.

"My Dear Sir,—I am honoured with a commission from Lady John Russell which I have the greatest possible pleasure in executing. Her Ladyship writes—'I wish to send an engraving of Lord John to the Mechanics' Institution at Leeds, as a little memorial of his visit, and as a token of the gratification with which I shall ever look back to the hearty welcome he met with from your fellow-townsmen. I hope it will be at Leeds by New Year's-day, and I venture to trouble you by directing it to your care, as I suppose yon will be there for your election.' I have duly received the portrait, and I now beg leave to place it in your hands, as President of the Mechanics' Institute. I am convinced that the members of the Institution will receive very thankfully this gratifying mark of her Ladyship's regard, though I believe they require no memorial to remind them of the honour of Lord John's visit, or of the pleasure and advantage which they derived from his valuable addresses. Believe me, my dear Sir, yours most faithfully,

"M. T. Baines.

"Mr. James Kitson, President of the Leeds Mechanics' Institution and Literary Society."

At a meeting of the Committee of the Institution held on Tuesday evening, Mr. James Kitson in the Chair, it was unanimously resolved—"That Lady John Russell be respectfully requested to accept the best thanks of this Committee for presenting to the Leeds Mechanics' Institution an engraving of Lord John Russell—a present highly valuable in itself, and still more so in their estimation as a memorial of the visit with which his Lordship has honoured the Institution, and of which its members and friends will long retain a grateful remembrance. That the Right Hon. M. T. Baines, M.P., be requested to inform Lady John Russell of the above resolution."

THE TRADES OF BIRMINGHAM.

The screw trade is unusually brisk, and good workmen are in requisition. This branch of manufacture now affords constant employment to about 1,500 pair of hands at good wages. At no former period was screw-making carried on with greater perfection, or larger quantities of this useful article produced, than at the present time. One may judge of the rapidity with which screws are made, from the fact that upwards of 2,000,000 gross are turned out annually, requiring a consumption of from 20 to 25 tons of metal per week. The makers at present have large orders on their books for screws of all sizes, intended chiefly for the United States and the European continent, and, in fact, every part of the world; for

Birmingham screws, like pens and buttons, find their way all over the habitable globe.

The Digbeth Battery Company are still busily employed in the manufacture of telegraph wire for foreign lines, and also tubing of various kinds of metal and dimensions. The demand for this description of work for marine boilers is now more extensive than it has been for many months past, attributable to the increase of shipping at home and in America; and, notwithstanding the extensive produce of tubing in the United States, some of the best orders on the manufacturers' books are from New York.

The orders from Australia still pour in, and speculation in goods for that colony is most extensive. The orders for iron and tin goods for the above market are large and remunerative. By a recent arrival from Australia, Messrs. Chubb, the lockmakers, received an order for a number of iron rooms, or safes, for the various banks of the colony. The supply of gold has increased so largely as to render it necessary for the bankers to prepare large iron rooms for its reception. They are to be of considerable dimensions, weighing about seven tons each, and protected by the most improved lock. These safes will, no doubt, be made at Messrs. Chubb's manufactory at Wolverhampton. Great activity prevails in the lock trade at Willenhall and Wednesfield, and the demand much exceeds the supply. Locks of every description are in demand, and orders will not be taken by the makers at the low prices of last year.

With iron, tin plates have again advanced, and a further rise in the price of copper is threatened. Manufacturers will not accept orders at present prices for any distant time. A manufacturer of iron wire, in reply to an order for 100 rings or bundles, in the course of the present week, replied that the price would be 10*l.* higher, and that that price would not be taken two days later. In the meantime the makers of articles of which iron, copper, and tin constitute the raw materials, continue to be greatly inconvenienced, and, in some instances, business is almost entirely suspended.

The gun trade is in expectation that, in consequence of a recent decision of the Board of Ordnance, the Minié rifle will be superseded by an improved musket, and that they will be favoured with fresh contracts.

A NEW IRON AND COAL-FIELD.

A detailed account of the discovery of an extensive coal-field, and of beds of ironstone, in the county of Leitrim, Ireland, is given in the last Number of the *Belfast News Letter*, and appears to indicate a new era of commercial and manufacturing prosperity for that country. It appears that about three miles from Drumkerin, six from Lough Allen, and nine miles south of Manorhamilton, there is a district called Crevelea, upon which operations were commenced last February by a Scotch company, for the purpose of making pig-iron. Their mineral take extends to the side of Lough Allen; but their present openings are immediately in the district just named. A gentleman of great experience as a civil engineer, and a member of the British Association, now resident in Belfast, has just visited the scene of these operations, and from a brief memoir which he has made of what he observed, the following extract has been taken. He says:—"I found they had the coals cropping out in various places, consisting of two beds, near each other, each from 2½ to 3 feet in thickness. In proximity to these they have two strata of ironstone, the one in balls from the size of an orange to 18 inches in diameter, both most easily obtainable, and the former particularly of the best kind, being equal to any stone found in the three kingdoms, and both carbonates of iron, from which two tons of the calcined stone will make one ton of pig iron. The coal is a brilliant black, of the utmost value as to its coking powers, as well as equal to the best coals of South Wales for evaporating steam, and singularly free from sulphur, the indication of which is only 0·5 per cent. I found a good road made, and all the outlay necessary for a blast furnace. An engine of more than 100-horse power, and the furnace, being heated, was to be able to charge in a few days; also large quantities of ore calcined, and coals ready, so soon as the furnace was sufficiently dry to use. From the way in which the coal and ironstone are obtainable, they can be brought to the furnace at about 3s. per ton; and, looking at the quality and the arrangements altogether, I have no hesitation in saying, that they will make iron as cheap, if not cheaper, than in either Scotland or England; and the quality of their pig iron will be second to none, since, with similar materials, this result has ever been insured. I expected a good deal from what I had heard before visiting the place, but it went beyond my expectations, and I returned satisfied that it only requires that district to be opened by railway communication in a very few years to make Leitrim the Staffordshire of Ireland. If such a field of mineral wealth were known to exist in any part of England which had no such means of access, I am quite sure a very short time would elapse before it would be at once developed, and its riches made available. I give this opinion as an engineer long ac-

quainted with mineral properties in England, and having no interest, personally, in any property in Leitrim."

The field of these operations is not very far distant from the Arigna Company's works, which have been, unfortunately, discontinued, in consequence of a combination among the workmen. The value of the Arigna ore is indisputable.

ROTATORY STORMS.

The following views respecting the phenomena of storms, which we find in a letter to the Editor of the *Times*, are worthy of attention, and will be read with interest:

"Sir,—Your correspondent, signing himself 'An Observer' of the recent storm, is most likely correct in his supposition that it was part of a vast rotatory storm or cyclone. Between the 3rd of January and the 8th of February last year there followed each other in grand procession no fewer than sixteen gales of wind, more or less heavy, with plenty of rain. They seemed to be a succession of rotatory storms, and the dead calms, or lulls, between them depended upon our being at that moment in the centre of the gyrations of wind. The temperature was, of course, high, and sometimes oppressive for the season of the year, for these storms brought up large quantities of heated air from the tropics as they ascended northward by west. These gyrations of wind advance with a right-shoulder movement or revolution to the west, and that this is correct is proved by the wind going round to the north-west as the gale passes northward. The captain of the ill-fated *Amazon* told Mr. Neilson (one of those saved) that the wind would veer round to the north with rain in the morning, which came to pass. Considering the known rate at which these storms travel, the area of their revolution must be very extensive, since they continue blowing south-west for six hours or more, and the right-shoulder movement does not reach us for several hours afterwards from the north-west. Thus, in the midst of the continued cold weather of last spring, the sultry weather on the 22nd and 23rd of March was probably caused by our being suddenly in the centre of one of these rotatory storms, for the foreign news informed us that about this very time an unexpected tempest swept the Adriatic and did great mischief. In this case the Adriatic felt the circumference of the storm of which we formed the centre.

"I am, Sir, yours, &c., J. A. H.

"Brighton, Jan. 8."

THE IRON TRADE.

Birmingham.—Last week we mentioned another advance of 20s. per ton on manufactured iron; and we have it now upon the authority of an extensive maker, that in all probability a further rise of 20s. will be declared at the quarter-day, which will be held during the ensuing week. It is said that less than 13*l*. per ton will not be sufficient to stop the influx of orders. Great difference of opinion exists as to the cause of this unusual excitement; some contending that it is the result of legitimate demand, while others attribute it in the outset to the speculation which took place some few weeks ago. That it must be recollected was, however, confined to pig-iron, particularly in the Scotch market, and when prices were at the lowest ebb. Now, however, almost all, if not all, our furnaces are in blast, and it is with difficulty that orders are taken and executed. The abundance of money, caused by the importation of gold, has no doubt in some degree contributed to the present activity of the trade, and a writer in *Aris's Gazette*, who is himself connected with the iron trade, asserts "that there is a good and sound demand for both home and foreign consumption which exceeds the amount of make, leaving out speculative transactions; while any extension of production is effectually precluded by the scarcity of materials for a time amply sufficient to cool all unwarrantable feeling." The Scotch take a different view of the question, and there is great reason to fear that, in this neighbourhood, more works will be put on than will ultimately be required to execute the demands of this and foreign countries. The experience of past years renders people apprehensive of similar disasters, but even the events of 1845 do not appear to operate as a caution against probable reverses.

Scotland.—Mr. Thorburn's Circular reports as follows on the Scotch Iron trade: —"The year 1852 will be ever memorable in the annals of the iron trade. After four years of unparalleled depression — prices fluctuating from the beginning of 1848 till the spring of 1852, between 47s. 6d. and 36s. 6d.—has followed an unprecedented reaction—a period of extraordinary activity —a rapid advance of fully one hundred per cent., and that, too, in the face of an increasing production, and an accumulating stock. In 1847 I wrote—'It is to be feared that if the price should advance above 85s., the export of iron, which was considerable last year, while prices were under 75s., will get a check. An accumulation of stock would thus follow, as in 1845.' The stocks of 270,000 tons in the stores of warehousekeepers, and 180,000 tons in the stores of the iron-masters, are chiefly held by English dealers and speculators, as was the case

in 1845, when purchases then made realised within one-and-thirty months, at a fall of 3*l.* per ton, entailing a loss, on one house alone, of upwards of 100,000*l.* Though the stock in Scotland is augmented 90,000 tons, the aggregate stock throughout the world is considerably diminished. But the scarcity of tonnage and high rates of freight, which will undoubedly prevail all this year, combined with the doubled cost of the article, must tend to stimulate the production, and enhance the profits of the iron-masters in England, the United States, and Continental Europe. Hence our home consumption and foreign exports will decline, as in the years wherein the prices ruled between 70s. and 80s. The average value per week of the whole make of pig-iron in Scotland was in 1830, 8,000*l.*; 1840, 22,000*l.*; 1845, 35,000*l.*; 1850, 25,000*l.*; 1851, 29,500*l.*—and at 75s. per ton, it is now 56,250*l.* per week."

Glasgow Pig-Iron Market.—Glasgow. Jan. 8.—Since the 1st inst. pig-iron has been quiet, and, influenced by the advance in the rate of discount by the Bank of England, prices have tended downwards. To-day we have had a very inactive market; very little being offered or wanted, prices may be considered nominal. Warrants, at 72s. 6d. cash; No, 1, 72s. 6d.; No. 3, 72s.; No. 1. Gartsherrie, 73s. against bills of lading.

America.—By the Royal Mail steamship *Africa*, which arrived at Liverpool on Sunday night with advices from New York to the 29th ult., we learn that the market for Scotch pig is exceedingly firm, and higher prices are now demanded, 500 to 600 tons sold at 30 dollars, and small lots at 31 dols. to 32 dols. 50c., 6 months; and 100 tons of Irish wrought scrap, 36 dols., less 4 per cent. for cash. Common English bars are held at 65 dols.; and refined, 72 dols. 50c. to 75 dols.

THE TIMBER TRADE.—1852.

The various circulars just issued by the houses engaged in the timber trade represent it to have been one of unexampled prosperity during the past year. A greatly increased amount of business was transacted, and prices having risen considerably, large profits were realised. This improvement, it is satisfactory to find, did not arise in consequence of speculation, but from a *bonâ fide* increase in the consumption of wood, and consequently the business transacted was of a legitimate character. The causes which led to this increase are chiefly the extraordinary activity displayed in the various private dockyards in England and in the Clyde, and the great demand for wood suitable for building purposes; but in all departments of the timber, or, more correctly speaking, the wood trade, the greatest activity prevailed throughout the past year.

The trade between England and Sweden has undergone some important changes. By the reduction of the import duty a large quantity of cheap wood has been received and eagerly bought up, which led a great number of minor ports in both Sweden and Finland to send cargoes to this country. From Sweden, 985,000 pieces of deal had been imported, against 547,000 in 1851; and 86,000 battens, against 44,000 in 1851. From Finland the increase had not been quite so extensive—355,000 pieces of deals, and 186, 000 battens, against 239,000 of the former, and 140,000 of the latter, in 1851, had been imported.

With Norway the trade was also active, though not to so great an extent as with Sweden and Finland. As regards Russia, Prussia, and the Baltic, there had been a falling off in the imports. The Canadian trade was active, and the imports of pine wood had been double those of the two preceding years. With regard to Quebec oak timber, the trade, on the contrary, was depressed throughout the past twelve months, and some of the stock of 1851, which cost 6*l.* per load, still on hand, is now to be had at 4*l.* 10s. From Nova Scotia and New Brunswick the trade in birch timber has greatly improved, and the imports were considerably in excess of those of 1851.

TRIAL TRIPS OF THE "IMPERIEUSE."

At ten minutes before 2 o'clock on Monday afternoon, the *Impérieuse*, having previously got her steam up, steamed out of the basin by back turns of her screw, and on entering the river immediately started for her trial trip; the screw almost getting up to full speed at starting, and on proceeding down the river the engines worked remarkably well, making up to 68 revolutions per minute with the greatest ease, and causing her to leave the *Monkey* and *African* steam-vessels, sent to attend her, far behind. Captain Watson, with all the officers, was on board, and Captain Hood, R.N., with Lieutenant Robertson, of the steam department afloat at Woolwich; Mr. Dinnen, inspector of steam-machinery afloat; Mr. Taplin, second assistant to the chief engineer at Woolwich Dockyard; Mr. John Penn, Mr. Mathew, and Mr. Hartree, of the firm of John Penn and Son, the constructors of her engines of 360 horse-power, on the "trunk" principle patented by that firm, and so successful in the *Arrogant* steam-frigate; and Mr. F. P. Smith, long connected with the

introduction of the screw-propeller into the naval service.

The *Impérieuse* went down the river in fine style, and ultimately left the *Monkey* and *African* far out of sight. On testing her speed at the measured mile, it was found to be upwards of 10½ knots per hour, the engines working most satisfactorily without the slightest symptom of heating or anything going wrong. On casting anchor below Gravesend all on board were much gratified at the manner in which she was brought up; as, notwithstanding her size, she appears as manageable as a small boat. A glance would at once afford evidence that she is a most powerful vessel, with ample room to mount and work with freedom guns of the largest calibre.

Her armament will consist of eight guns, each 9 feet in length, and weighing 65 cwt., with an 8-inch bore, and twenty-two 32-pounders of 56 cwt., and 9 feet 6 inches long each. On the upper deck she will have one pivot gun of 95 cwt., and 10 feet in length, for 68-pound shot, or 10-inch shell (already mounted); two 8-inch guns of 65 cwt. each, and eighteen 32-pounders of 45 cwt. each, and 8 feet 6 inches long each.

Captain Watson is very popular in the service, and has had the offer of many men, but he has declined them, so as not to prevent other officers completing their crews, as he has no doubt of being able to man his ship with the greatest ease by the time she is ready for sea. A number of his best hands joined the ship at Chatham, for which port she left Gravesend at daylight on Tuesday; but previous to going up the Medway, she will be tried several runs between the Nore and Mouse Lights, to test her speed in deep water.

On the following day the *Impérieuse* had her steam up again shortly after 7 o'clock, and having heaved her anchor, started on a further trial trip between the Nore and Mouse Lights, in the deep water of that channel. She soon left the *Monkey* and *African* steam-vessels far behind, to the surprise of the crews of the numerous craft on the river. She arrived at the Nore at 35 minutes past 9, and finished her trial, running the distance of 15 knots and 200 yards from the Nore Light to the Mouse Light and back, at 13 minutes past 11,—showing a speed of 8·927 knots against the tide, which ran very strong, and a speed of 12·420 with the tide, but against a double reef topsail breeze. The average of the run out and back to the Nore was consequently 10·673 knots per hour; the number of strokes of the engines, as counted by a machine in operation during the whole trial, was 67·7 per minute, and an equal number of revolutions of the screw-propeller, 16 ft. 6 inches in diameter, and having a pitch of 16 feet. The draught of water of the *Impérieuse* during the trial was 16 feet forward and 18 feet 3 inches aft.

After the trial, the *Impérieuse* was steered for the Medway, and, having taken on board a pilot sent out by the Admiral from the port of Sheerness, she proceeded up that river, and arrived under the sheer hulk at Chatham at 5 minutes past 1 o'clock, P.M., where one of her masts and her bowsprit were suspended in mid-air ready to be put on board. It is worthy of remark, as unexampled in any previous trial of engines for the first time, that there was not, from the moment the *Impérieuse* left Woolwich until she arrived at Chatham, an engineer's stoppage for one second to adjust any of the screws or other parts of the engines. Everything worked so satisfactorily that the few adjustments required were performed with the greatest ease while at full speed. The only times the engines had to be eased was when the numerous vessels in the river could not get out of her way.

Photographic Society.—A Committee was formed early in the spring of last year, with a view to the establishment of a photographic society, but the existence of patent rights prevented the object from being carried out at that time. The discussion, however, which took place on the subject between Mr. Fox Talbot and the Committee, and the appeal made to that gentleman by the presidents of the Royal Society and the Royal Academy, induced him to abandon them, and, with a slight exception, to leave the act unfettered. This obstacle being removed, the Committee have resumed their labours; and it is understood that nearly 200 persons have given in their names as desirous to join the society, and that a meeting will shortly be called to launch it, and elect its officers. It is intended to hold meetings once a fortnight during the first year of its formation, when communications will be read, specimens exhibited, and discussion ensue on subjects and novelties connected with the art. Probably a laboratory will, in time, be established, where experiments may be carried on and processes tested. A gallery, too, of photographic pictures will doubtless form part of its proceedings, and remain open during the usual seasons, when the progress of the art will be shown from year to year. The subscription, it is said, is to be one guinea annually, with an entrance-fee of one guinea. The bringing together individuals who have hitherto been working at the art, in ignorance of what each was doing, cannot fail to assist in its development.—*Journal of the Society of Arts.*

ROYAL GEOGRAPHICAL SOCIETY.

On Monday evening a meeting of the members of the Royal Geographical Society was held at the Royal Institution, Albemarle-street,—Sir Roderick Murchison in the chair.

Captain Allen, R.N., read a paper on the feasibility of cutting a canal between the Gulf of Akaba and the Dead Sea. The paper was principally devoted to an attempt to account for numerous appearances of sudden and violent drainings on the sides of the basin of the Dead Sea. The Dead Sea, as is known, is upwards of 1,300 feet below the Mediterranean—a fact which, although known, has not, according to Captain Allen, been satisfactorily accounted for. He made certain observations during his travels along its shores, and had come to the conclusion that the Gulf of Akaba, at the north-eastern point of the Red Sea, was at some distant period connected with the Dead Sea, although the channel is now filled up, either by a gradual upheaving of the land, by the growth of coral, by deposit of sand and gravel thrown up by the sea, or by the sand of the desert. The tract of country between the Gulf of Akaba and the Dead Sea does not seem as yet to have been very satisfactorily surveyed, but Captain Allen concludes that the Dead Sea was also originally connected with the Mediterranean, the Lake of Tiberias being one of the links of the chain, and that by evaporation the intervening district was dried, and by upheavals or otherwise, barriers made, which have now divided what might have been an unbroken sea, into a series of lakes.

A vote of thanks was passed to Captain Allen for his valuable communication, and another to Sir Roderick Murchison, after which the Meeting terminated.

SOCIETY OF ARTS.

The sixth ordinary meeting of the Society of Arts was held on Wednesday last in the great room of the Society's house, John-street, Adelphi, James Meadows Rendel, Esq., F.R.S., Vice-president, in the Chair.

The usual routine business having been commenced, Mr. C. Shepherd, Jun., read a paper "On Improvements in Electric Clocks, and the Means of Working the Greenwich Time Signals."

The author divided the subject into two parts. In the first, he gave a short history of the application of electro-magnetism to horological purposes, with an account of recent improvements; and in the second, the clocks which have been constructed for the Royal Observatory, and the arrangements which are there made for transmitting Greenwich time-signals, and dropping time-balls, were described.

The principles and action of the pendulum were well known. If, for instance, a weight suspended by a cord were set swinging, it would be found that whether its vibrations were long or short, they would be performed in very nearly the same space of time. This was termed the "isochronism" of the pendulum, and depended entirely on its free motion. If, however, in making the arrangements for transmitting the sustaining power to the pendulum, a resistance had to be overcome at the end of its vibrations, the motion would no longer be isochronous, but would gain in the long arcs. If the power applied to the pendulum varied, so as to increase or diminish its vibrations, the clock would vary in time; while if the power were invariable, then the isochronism of the pendulum would be of no consequence, because the vibrations would never alter in length. To make a clock, then, that would measure time with moderate accuracy, one of two points must at any rate be attained; either the pendulum must be isochronous, or the power perfectly equal: and in a perfect time-keeper the pendulum should be isochronous, and the power equal.

Soon after the discovery of the dry pile by De Luc, the electrical attraction and repulsion of that instrument was applied, as a motive-power, to light pendulums, many continuing to act for months together. In 1815, Zamboni adopted a mechanical contrivance to the pendulum, by which a train of wheels was kept in motion, and thus made, it is believed, the first clock in which electricity was the only motive-power employed, though it more resembled a philosophical toy than a clock. In 1819, the discovery by Oersted of the influence of an electric current on a magnetic needle, opened a new field for inquiry, and many important applications were proposed, among which the electric telegraph stood pre-eminent. Another result of the discovery of Oersted was the electro-magnet. That was the power of conferring upon a bar of soft iron any degree of magnetism by the circulation of an electric current around it, and that these magnetic energies ceased the moment the electric current ceased. The attractive force of an electro-magnet upon a soft piece of iron, which enabled it to lift and drop a weight, raise and depress a loaded lever, or bend and release a spring, caused a number of machines to be made, in which this power was used as a prime mover. Another result of the discovery was exhibited in so arranging the electro-mag-

nets that their poles might be alternately inverted; and thus the adjacent permanent magnets might be acted upon by attraction and repulsion alternately.

In the year 1837, Professor Wheatstone obtained, in conjunction with Mr. Cooke, a patent for electric telegraphs, in which was included an instrument for exhibiting the letters of the alphabet in succession in an opening made in the dial-plate, the letters being arranged round the rim of a disk. Or a hand was made to point to the letters arranged round the dial, the circuit being made and broken by hand. It occurred to Professor Wheatstone, and was pointed out by him to several gentlemen who inspected his telegraph, among others to the Astronomer Royal, that if the apparatus for making and breaking contact were moved by a clock, and figures were substituted for the letters on the dial of a telegraph, the telegraph would then become a clock, each movement of the seconds' hand of the original clock producing a corresponding motion in the electro-magnetic clock. This was carried out by Mr. Dent, in the year 1840, when the clock was exhibited in the rooms of the Royal Society, and Professor Wheatstone read a paper on the subject containing many most important suggestions. In the succeeding year Mr. Bain applied for a patent for improvements in the application of motive power to clocks, in which he specified a method of applying electro-magnetism to that purpose, almost identical with the letter telegraph just mentioned. In 1843 Mr. Bain obtained a second patent for improvements in electric telegraphs and the measurement of time. In this patent an ingenious method was described for communicating motion to the pendulum by electric currents of very low intensity. To the lower extremity of the pendulum-rod a coil of copper wire was attached, the hole in the reel on which the wire was wound being of such a size as to allow it to vibrate freely over the poles of two permanent bar magnets, but without touching them. The galvanic circuit for exciting the coil of wire was made and broken at the proper intervals by a sliding bar of metal, pushed to and fro by an arm projecting from the pendulum as it vibrated. This sliding bar or break was so arranged that when pushed to the right the circuit was complete, and when pushed in the opposite direction the circuit was broken.

The pendulum, having arrived at its extreme motion to the right, returned in the contrary direction by its own gravity, being at the same time urged in that direction by the magnetic action of the coil of wire on the permanent magnets. Having completed its vibration to the left, the pendulum again moved the break, thereby breaking the contact on which the transmission of the galvanic current depended. The coil now ceasing to act upon the magnets, the pendulum returned, and in doing so re-made the contact, and received a push from the magnets; and so on at each vibration. The necessary wheel-work for carrying the hands was moved by the pendulum, one tooth of the seconds' wheel being pushed forward at each vibration. This method of actuating a pendulum had been found deficient. In the first place, the pendulum was not isochronous, nor did it oscillate without resistance, as it had to move the slide-break at each vibration. Secondly, the power was unequal, as the impulse given to the pendulum depended on the varying power of the battery, which, being applied directly to the pendulum, produced a corresponding variation in its vibrations. Such an arrangement was therefore very imperfect, and the performance of a clock so constructed could not be depended on.

At this time Mr. Appold proved experimentally, that a slight alteration in the quantity of electricity produced a great difference in the rate of the clock; and by the application of a new form of break, which kept the pendulum more nearly to one length of vibration, had much improved its performance. About seven years ago, Mr. Shepherd's attention was directed to the application of electro-magnetism as a motive power for clocks; and the idea occurred, of causing an electro-magnet to raise a weight, or bend a spring to a certain fixed extent at each oscillation of the pendulum; and to employ the weight, or the elasticity of the spring, to impart the necessary impulse. By these means the continually varying force of the electro-magnet would be regulated exactly by the amount of power which the pendulum required to continue its motion. In this arrangement the electro-magnet performed only a secondary part, and the irregularities to which it was subject were of no consequence.

The arrangement which had been made at the Royal Observatory, Greenwich, at the Tonbridge Station of the South-Eastern Railway, and several other places, was then described. A brass bracket was fixed on the bed-plate, to the left of the pendulum-rod, into the lower part of which the pivot of a small axis was introduced. To this axis two levers were fixed at right angles to each other, the one horizontal, the other vertical. On the horizontal arm there was a small sliding weight for giving the impulse to the pendulum. The pivot of another axis was introduced at the top of the bracket, and this also carried two levers at right angles to each other, the horizontal

lever having a sort of latch-shaped point, and forming what is technically called the "detent." The relative positions of this latch-pointed lever, and the point of the perpendicular lever on the lower axis, were so adjusted that when the horizontal weighted lever was raised, the point of the vertical lever should pass the latch-shaped point of the detent, and be held by it until the detent was raised. Two projecting points, attached to the pendulum-rod, were so adjusted, that when one of them, called the "discharging point," pressed against the vertical lever so as to raise the detent, the other, or "impulse point," would be almost in contact with the vertical arm of the weighted lever, or just in the position to receive the impulse. A compound lever was so arranged that one end carried an iron keeper over the poles of an electro-magnet, while the other was beneath the horizontal weighted lever, so that when the magnet was excited, the motion of the lever to which the keeper was attached raised the weighted lever, and locked it on the latch-point of the detent. The contact on which the transmission of the galvanic current through the coils of the electro-magnet depended was made and broken by the pendulum touching a platinum spring each time it moved to the right.

The action was as follows:—The pendulum moving to the right touched the break-spring, thereby completing the galvanic circuit through the coils of the electro-magnet, which, by its attraction, moved its keeper and also the lever to which it was fixed. This motion lifted the impulse lever, which, passing the latch-point of the detent, could not return. The pendulum now moved to the left, and breaking contact with the break-spring, the electricity could no longer pass; the electro-magnet released its keeper, which was immediately withdrawn from it by a counterpoise weight, leaving the impulse lever held by the detent. As the pendulum continued its motion to the left, the discharging point pressed against the perpendicular lever and lifted the detent. The perpendicular arm of the impulse lever was then immediately brought in contact with the impulse point by the gravitation of the weight on the horizontal lever. As the pendulum again moved to the right, the impulse lever followed it, and pressed it gently in that direction, with a power depending on the magnitude of the weight. At the completion of the vibration to the right, the pendulum, touching the contact-spring, again caused the electro-magnet to raise the impulse weight; and on moving to the left, it lifted the detent and received another impulse. As this action would continue as long as the battery retained sufficient power to cause the electro-magnet to raise the impulse weight, it was evident that the pendulum would receive a perfectly regular impulse each vibration, totally independent of the power of the battery employed, and would be kept at one constant arc of vibration with the most unerring precision.

The connection of the pendulum with the necessary wheels for carrying the hands to indicate the time on dials, and the method of moving one or more such arrangements sympathetically with the motion of the pendulum was next described. After making many experiments, the author proved that by far the best arrangement for moving distant clocks by galvanic currents was to use the attractive and repulsive forces of two electro-magnets, exerted simultaneously on the opposite ends or poles of permanent bar magnets. The clocks consisted of a small frame of brass, into which the pivots of the ordinary wheels for reducing the motion of the seconds' wheel to that of the hour and minute hands were introduced; two electro-magnets, one on each side, being also fixed to it. An axis at the upper part of the frame had two or more permanent bar-magnets fixed at right angles to it, in such a position that their poles should be immediately over those of the electro-magnets; and on the same axis were fixed what are called the "pallets," consisting of two arms, having inclined planes at their extremities, which being pushed alternately against the teeth in the seconds' wheel, caused it to revolve, step by step, and so communicate motion to the train of wheels, and consequently to the hands. If an electric current were transmitted through the coils of the electro-magnets, so as to cause one side of the clock-frame to attract the permanent magnets, while the other repelled them, the axis on which the magnets were fixed would make a partial revolution, and the pallets acting on the seconds' wheel would drive it forward one step or second. If the direction of the electric current were now reversed, it would cause the bar to make another oscillation; and so on each time the current was reversed. The reversing of the direction of an electric current was best effected by employing two batteries. A wire from the positive pole of one battery, and one from the negative pole of the other were soldered together, and after passing round the coils of the electro-magnets, terminated at the pendulum.

The author had clocks of this description in operation for several years. A pendulum and two dials, fixed at the Electric Telegraph Station at Tonbridge, were set to Greenwich mean time on the 12th of April

last, and on comparing them on the 21st of August, they were found to be only 21 seconds fast. From this time their rate was taken daily; and on the 1st of October, after seven months' uninterrupted action, they were only 8 seconds fast. The author believed that the performance of these clocks might still be improved by giving the impulse to the pendulum in the middle of its vibrations, and by using water for completing the circuit instead of springs. To accomplish this, advantage had been taken of the slowness of action of an electro-magnet, and a peculiar form of *remontoir* escapement, superior, both theoretically and practically, to that generally in use, had been adopted with success at the Royal Observatory, and was much approved by the Astronomer Royal.

The author next proceeded to describe the arrangements which had been made at the Royal Observatory, Greenwich, for transmitting mean-time signals, through the medium of the Electric Telegraph, to all parts of England. This important idea was believed to have originated with the Astronomer Royal. During the last year, four insulated copper wires were laid in the ground from the Royal Observatory to the Lewisham Station of the North Kent Railway, and from thence along the side of the railway to London-bridge. Here a connection was established at certain times with the wires leading to the central station of the Electric Telegraph Company. At the Branch-office, in the Strand, a time-ball had been erected from a design by Mr. Edwin Clark, engineer to the Telegraph Company, which was dropped daily at one o'clock, simultaneously with the fall of the time-ball at the Royal Observatory. At the Royal Observatory, one of the author's electro-magnetic clocks had been erected, the object of which was to complete the galvanic circuit each hour, automatically. This was effected by breaking the contact in three places; namely, at the twenty-four hour wheel, the one-hour wheel, and the one-minute wheel. No signal could therefore pass until these three contacts were made simultaneously. To effect this object, two metal springs were fixed parallel to each other on a block of ivory, so as to insulate them from each other and from the frame of the clock. A pin was fixed to an arm carried by the axis of the seconds' hand, which, coming in contact with an inclined plane fixed to the upper spring, bent it so as to cause it to make contact with the other. The inclined plane was of such dimensions that the contact between the two springs was maintained for one second only. As the seconds' hand revolved once a minute, it was evident that this contact between the springs would take place at intervals of equal duration. The contact-pin and seconds' hand were fixed to the arbor of the one-minute wheel, in such a manner that when the latter pointed to the 60th second, the two springs were pressed in contact by the pin. A similar pin to that carried by the seconds' wheel, and acting on two other metal springs in the same way, was attached to the axis of the minute-hand. The contact between these two springs was made half a minute before, and broken half a minute after each hour.

In the 24-hour wheel, 23 pins were screwed, which acted upon a third pair of springs insulated in the same manner as those already described. In this case, however, the contact was made 5 minutes before each hour. An ordinary sands acid-battery, consisting of 72 elements, had one of its poles connected, by means of the gas-pipes, with the damp earth at Greenwich, the opposite pole being connected with the upper of the two one-minute contact springs. At 5 minutes to any hour, except one o'clock, one of the pins in the 24-hour wheel made and maintained the contact between its two springs. At half a minute to the hour, the one-hour contact was made by the movement of the minute hand. The third and last contact still remained broken; but as the seconds' hand dropped to the 60th second of the last minute of the hour, the one-minute contact was made. This, the only remaining break in the circuit, being now closed, the galvanic current instantaneously passed. At all hours of the day, except twelve, three, and four o'clock, the Greenwich wire was in permanent connection with a wire leading to the central telegraph station, Lothbury. At twelve and four o'clock the train of wheels at the London station lifted the Greenwich wire out of contact with the Lothbury wire. At the same time the Dover wire was pressed into contact with the Greenwich London wire, so that at those hours the signal arriving from Greenwich would pass down the telegraph wire to Dover, causing a single deflection of the indicators of all the telegraph instruments through which it passed. At three o'clock the same operation was performed with one of the telegraph wires of the North Kent Railway, by which means that hour was indicated in the same manner at Rochester and all intermediate stations.

Another pair of springs placed on one side of the 24-hour wheel was fixed at such a distance from the place of the wheel, that the whole of the 23 pins, except one which was much longer than the rest, passed without touching them. This long pin corresponded to one o'clock, and its object was

to complete automatically a galvanic circuit through the coils of two electro-magnets, which, by their attractive force, exerted upon a piece of iron, release the Greenwich time-ball. The instant the galvanic circuit was completed by the motion of the Greenwich ball-trigger, an electric current passed, which, operating upon the electro-magnetic trigger, caused the fall of the time-ball in the Strand simultaneously with that at Greenwich. There were six sympathetic dials at present going in connection with this automatic clock, four of which were fixed at the Royal Observatory. The fall of the ball was broken by the rod which supported it being made to enter a cylinder, from which the air was allowed to escape by a cock partly open. The partial condensation of air which thus took place, operated as a spring, and eased the downward momentum of the mass. Since the erection of these clocks, a clock had been placed in the Telegraph-office, and another in the Superintendent's-office at the London-bridge station, in connection with the automatic clock at Greenwich, using the earth as a return circuit.

These clocks were not all in one circuit, but were divided into three groups. First, the large clock in the outer wall of the Observatory formed one separate circuit, the length of wire being 10,000 feet, wound on four electro-magnets; secondly, the automatic and three small clocks formed another circuit, 9,000 feet in length, 3,000 feet on the automatic, and 2,000 feet on each of the small clocks; and, thirdly, a circuit was formed through the London wire, and two clocks at the railway station. This latter circuit was about 10½ miles long,—being the longest distance, it is believed, through which electro-magnetic clocks had yet been practically worked.

In answer to some questions put by Mr. Denison, Mr. Shepherd explained, that these clocks could be maintained in perfect action for several years at a small expense.

The thanks of the Society having been voted to Mr. Shepherd and to the chairman, the meeting terminated.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JANUARY 15, 1853.

James Edward Coleman, of Porchester-house, Bayswater, gentleman. *For improvements in the application of India-rubber and gutta percha, and compounds thereof.* (A communication.) Patent dated June 28, 1852.

These improvements consist in various modes of applying India-rubber and gutta percha or their compounds, in order to lessen the effects of concussion or vibration, and to produce spring bearings for unyielding substances brought into statical or dynamical contact.

The drawings show how these materials may be applied to the buffer, bearing and draw springs of railway vehicles in a variety of manners; to carriage-wheels, between the felloe and tyre, in order to lessen the draught and give an elastic bearing; to the supporting of the rails on railways, a slip of elastic material being interposed between the rail and its sleeper, or chair; to the bearings of shafts, beams and side levers of steam engines, where a strip of the material is also placed, so as to receive the weight of the bearings; to wall-boxes, in a similar manner; to the hammer-head and block of Nasmyth's steam-hammer and of the ordinary tilt-hammer; beneath anvils, in order to prevent their harsh jarring noise when struck; and to railway and other carriage windows, to prevent the sashes shaking in the frames. These exemplifications are sufficient to show the scope of the invention, the claims in respect of which embrace not only the several modes of applying elastic material described, but also the use of the same generally for the purposes specified.

Duncan Mackenzie, of London, gentleman. *For certain improvements in machinery and apparatus for reading in and transferring designs or patterns, and for cutting, punching and numbering, or otherwise preparing perforated cards, papers, or other materials used, or suitable in the manufacture of figured textile fabrics by Jacquards, or other weaving-looms or frames.* Patent dated June 29, 1852.

The object of this invention is to simplify and facilitate the operation of reading in and transferring designs for the Jacquard or other similar machines, and this Mr. Mackenzie accomplishes by an improved arrangement of reader, and by combining within the same frame-work the several mechanical parts requisite to effect the operations of cutting, punching, numbering, and perforating the pasteboard or cards used in preparing the designs.

The *claims* embrace the general arrangement of parts shown, and the different modes of performing the several operations incidental to the working of the apparatus.

Lazare Francois Vaudelin, of Upper Charlotte-street, Fitzroy-square. *For improvements in obtaining wool, silk, and cotton from old fabrics in a condition to be again used.* (Partly a communication.) Patent dated June 30, 1852.

The operation of converting old fabrics into fibres for being again employed in ma-

nufacturing woven goods has been hitherto performed on such fabrics whilst in a dry state, by which means the fibres were in a great measure injured or destroyed. The loss resulting from this process the patentee now proposes to obviate by operating on the fabrics whilst wet, so as to enable the fibres composing them to be drawn out or untwisted, instead of being broken, as heretofore. The materials are cut into pieces of from 2 to 8 inches square, and subjected to the action of machinery which is similar to that used by paper-makers, two beating-wheels and plates of teeth being provided in the same trough, and a stream of water kept constantly flowing through it. When operating on silk rags, the water should be used at a temperature of about 80°, and a small quantity of soft soap may be advantageously introduced into it. In conclusion, the patentee states that the mode of operating "may be varied, so long as the peculiar character of the invention, that of treating old fabrics in water so as to separate their fibres into a state to be again used with other fibres in the manufacture of fabrics by spinning and weaving, be retained."

Richard Hornsby, of Spittlegate, Grantham, Lincoln, agricultural implement-maker. *For improvements in machinery for thrashing, shaking, riddling, and dressing corn.* Patent dated July 3, 1852.

This improved machinery is intended to perform within itself the several operations of thrashing, shaking, riddling, and dressing corn. The arrangements for this purpose when separately considered, are similar to what have been employed before, the main novelty being their combination into a portable machine. The corn on entering the machine is passed into a threshing drum of ordinary construction, where the grain is separated and falls into a trough beneath, whilst the straw, on issuing from the threshing drum is received in a shaker, which separates the corn which it may still contain, allowing it to fall also into the same trough that had previously received that from the thresher. This trough is inclined upwards and has two screws working in it, which raise the corn on to an inclined plane, from which it falls on to the first riddle, and thence down another incline to a second riddle, on passing through which it is acted on by a blast of air from a fan-blower, by which the chaff, &c., are completely separated, and the corn is then delivered from the machine in a cleaned state, the "spoutings" being carried in an opposite direction and again passed through the machine. The blast of air from the blower is divided by the inclines, so as to cause a portion of it to traverse the first riddle whilst the other portion acts on the grain, &c., coming from the second riddle. The power by which the whole machinery is driven is applied to the shaft of the threshing arrangement, and thence by bands or other means to the shaker, riddles, fan, and screw-feeders.

Claim.—The combination of mechanical parts into a portable machine for threshing, shaking, riddling, and dressing corn.

Alfred Henry Gaullie, of Paris, sculptor. *For an improved plastic composition applicable to manufacturing purposes.* Patent dated July 6, 1852.

This "improved composition" is formed by mixing together equal parts of gutta percha and of Roman cement reduced to a pasty consistence with ox gall. The operation of mixing is to be performed while the gutta percha is in a heated and plastic state, and the two ingredients must be well masticated, so as to cause them to combine intimately together. Any kind of colouring matter may be combined with the materials according to the effect desired to be produced.

Claim.—The production of a plastic waterproof composition susceptible of receiving the different shades of coloration for superseding gutta percha and caoutchouc, alone or combined with other materials in their different applications.

William Tanner, of Exeter, leather-dresser. *For improvements in dressing leather.* Patent dated July 6, 1852.

These improvements consist in using blubber combined with cod-liver oil for dressing leather. The blubber is first melted by the application of heat, which should not exceed 130° to 140° Fahr., and an equal quantity of cod-liver oil is then introduced, and well stirred, in order to incorporate it thoroughly. The mixture should be used at a temperature of about 70° to 80° Fahr., and well-stirred previous to removing any portion of it from the vessel in which it is contained. For thick skins, the proportion of blubber must be reduced, as they do not so readily absorb the mixture as thinner ones, for dressing which a larger proportion of blubber than that above stated may be employed.

Claim.—Combining blubber with cod-liver oil, and using them together for dressing leather.

Thomas Blakey, and Joseph Skaife, of Keighley, York, millers. *For improvements in mills for grinding.* Patent dated July 6, 1852.

These improvements consist in forming the grooves or lines on the surfaces of mill-stones in compound curves, instead of in simple curves or straight lines as heretofore.

Claim.—The use or employment of grinding surfaces with compound curved lines formed thereon.

EDWARD MAITLAND STAPLEY, of Cheapside. *For improvements in cutting moulding grooves, tongues, and other forms, and in planing wood.* (A communication.) Patent dated July 6, 1852.

The *first* part of this invention has relation to machinery employed for planing and moulding boards, and consists in mounting the cutter-stocks so that the cutting edges may adjust themselves to any variation in the thickness of the boards, in combination with an endless chain feeding-table, and with making the throat of the cutter-stock capable of being expanded, so as to afford greater facility for the passing away of the shavings removed by the planes.

The *second* part of the invention has relation to "jackers," or rough planing machines, in which the patentee adopts arrangements having a similar object to that of the machinery before mentioned.

The *third* part of the invention consists in arranging the cutters of machinery for tonguing and grooving boards in such manner that there shall be a gouge-cutter and a fleam or chisel-cutter with lips alternately in the series, by which means the work is performed more cleanly and with less risk of splitting the boards or choking the cutters. Another machine is also described, in which two sets of stationary rebating-cutters are used, having a space between them for the escape of the shavings removed.

The *fourth* part of the invention consists of a mode of mounting and arranging the cutter-stocks and cutters of tonguing and grooving machines.

MARTYN JOHN ROBERTS, of Woodbank, Bucks, gentleman. *For improvements in the production of electric currents, in obtaining light, motion and chemical products and effects by the agency of electricity, part or parts of which improvements are also applicable to the manufacture of acids and to the reduction of ores.* Patent dated July 6, 1852.

JAMES HIGGINS, of Salford, Lancaster, machine-maker, and THOMAS SCHOFIELD WHITWORTH, of the same place, mechanic. *For certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.* Patent dated July 6, 1852.

These improvements have relation to self-acting mules of the peculiar construction described in the specification of a former patent of Messrs. Higgins and Whitworth, dated September 24, 1849. The principal feature of that arrangement was, that the stretch was given by the carriages mutually receding from each other, the roller-beams moving in a vertical direction while the motion of the carriages was in the arc of a circle. Instead of this, it is now proposed to cause the carriage or carriages to traverse in right lines at an angle to the direction in which the roller-beam or beams is, or are moving, the vertical motion of the latter being still preserved, and this, whether in single or double machines. The claim is for "performing the stretch in self-acting mules by causing the roller-beam or beams to move in a vertical direction, and the carriage or carriages to traverse in a right line at an angle thereto."

HAROLD POTTER, of Over Darwen, Lancaster, carpet manufacturer, and MATTHEW SMITH, of the same place, manager. *For certain improvements in looms for weaving and in the manufacture of terrry fabrics.* Patent dated July 6, 1852.

The *first* of these improvements has for its object to facilitate the introduction of the wires used in weaving carpets and terry fabrics, and consists in applying a lid to the trough in which the wires are deposited previous to being projected into the shed, in combination with a new arrangement of mechanism for actuating the transferring arms, by which the wires are deposited in the trough, and for presenting the wires to the transferring arms. In order to enable the wires to be the more readily taken hold of, they are formed with a hook or notch at their ends.

The *second* improvement consists in applying weft stopping apparatus to each side of looms for weaving piled fabrics, so that the loom may be stopped in the event of the weft failing or breaking on either side.

The *third* improvement consists in weaving terry fabrics on two-wire looms with two picks of weft only between the terries, instead of three or more picks, as customary.

The *fourth* improvement comprises a method of enabling the weaver to ascertain at all times whether the weaving is proceeding in a satisfactory manner when printed warps are employed, and to regulate the tension on the warp according as too much or too little is being given off for the pattern to be produced. This is accomplished by the use of a tape or band, coloured so as to correspond with the figure on the warp, which tape or band is caused to move in the same direction as, and by the side of, the warps at a regular speed; and by observing the relative positions of the band and warps, the weaver will be able to see whether a proper quantity of warp is being delivered, and to regulate its tension accordingly.

The *fifth* improvement is in the taking up mechanism, which the patentees arrange in such manner as to remain stationary when the motion of the loom is reversed, the taking up motion only continuing while the loom is working in the proper direction.

The *last* improvement consists in a mode

of producing piled fabrics by employing the weft instead of the warp threads to form the pile. For this purpose it is preferred to work with two shuttles, floating in the weft from one shuttle to form the pile loops, which are afterwards cut by knives moving at right angles to the direction of the weft, and using the second weft to bind in the first. A single shuttle only might be employed with a similar result, the same weft being then used form the pile, and to act as a binder.

WILLIAM MURDOCH, of Staple's-inn, Holborn. *For an improvement in the manufacture of certain kinds of woollen fabrics.* (A communication.) Patent dated July 6, 1852.

This improvement consists in subjecting milled or fulled woollen fabrics to an operation of beating, whereby the exterior fibres will be brought to an upright position, forming a pile, which is to be reduced to a uniform length by shearing. The beating is performed by rods striking the fabric across its length whilst in a wet state; and as the pile is only raised on each side of the part struck by the rod, care must be taken to shift the fabric gradually, so as to bring a fresh portion of it constantly under the action of the beating-rod. The operation may be repeated if the pile is not sufficiently raised by a single treatment.

Claims.—1. The imparting to milled fabrics a surface resembling velvet by raising the pile by any suitable means, so as to cause it to stand perpendicular to the ground of the fabric, and afterwards shearing the pile so as to present a uniform surface.

2. The mode of imparting to milled stuffs the appearance of velvet.

JOHN RAMSDEN, of Manchester, screw-bolt manufacturer. *For certain improvements in machinery or apparatus for cutting screws.* Patent dated July 6, 1852.

Mr. Ramsden's improvements consist in substituting for the die or chaser ordinarily employed in screw-stocks for manufacturing screws, a pointed cutting tool, which may have either a single or double cutting edge, similar to the letters V or W, and which can be used in either direction, the cut being equally effective in the forward or backward motion of the tool. An arrangement of bevel-wheels and screws is applied to the holders carrying the cutting-tools in the stock, and of which there may be four, or other convenient number, so as to enable them to be simultaneously advanced or carried back, according to the varying diameter of the screw-blank to be threaded.

Claim.—The peculiar form of cutter for manufacturing screws and screw-bolts without reference to the mechanism to be employed for advancing or retreating the same, or whether the same may be adapted to hand, steam, or other power.

WILLIAM SEPTIMUS LOSH, of Wreay Syke, Cumberland, gentleman. *For improvements in obtaining salts of soda.* Patent dated July 6, 1852.

This invention consists in obtaining salts of soda by treating certain sulphurous compounds with a solution of caustic soda or of carbonate of soda.

EDWARD CLARENCE SHEPARD, of Duke-street, Westminster, gentleman. *For improvements in electro-magnetic apparatus suitable for the production of motive power, of heat and of light.* (A communication.) Patent dated July 6, 1852.

Specification Due, but not Enrolled.

JULES LEMOINNE, chemist, of Courbevoie, near Paris. *For an improved composition applicable to the purposes of varnish, to the waterproofing of fabrics, to the manufacture of transparent fabrics to the fixing of colours, and to other useful purposes.* Patent dated July 6, 1852.

PROVISIONAL PROTECTIONS

Dated December 21, 1852.

1117. Robert Powell. Improvements in coats and outer garments.

1119. Jean Baptiste Moinier and Charles Constant Boutigny. Improvements in concentrating syrups and other solutions, and in distillation.

1121. George Beadon Improvements in constructing and propelling ships and vessels.

1123. Warren De la Rue. Improvements in preparing the surfaces of paper and card-board.

1125. Edward Duke Moore. An improved preparation of malt and hops.

1127. John Roydes. Improvements in machinery or apparatus for drawing cotton and other fibrous substances.

Dated December 22, 1852.

1129. Celestine Denis veuve Quinchez. A new or improved fabric or texture which may be used for making mantles, bonnets, and other articles of female attire.

1131. John Roberts. Improvements in apparatus for preserving animal and vegetable matters, and for cooling wines and other liquids.

1133. John Henry Johnson. Improvements in machinery or apparatus for forging iron and other metals. A communication.

1135. William Aspdin. Improvements in the manufacture of Portland and other cements.

1137. Frederick Ayckbourn. Improvements in rendering certain materials impervious by air or water.

1139. John Livesey. Improvements in lace-machinery, and in piled fabrics made from such machinery.

Dated December 23, 1852.

1141. Alfred John Hobson. A new or improved metallic bedstead.

1142. John William Couchman. Safely fastening window-sashes.

1143. Alexandre Deutcsh. Improvements in treating oil of Colza and similar oils.

1144. Christopher Binks. Improvements in the composition of paints.

1145. William Westley and Richard Bayliss. An improved fastener, applicable to the fastening of window-sashes, tables, and other similar purposes.

1146. Nicolas Malinau. Improvements in stopping or covering bottles, decanters, pots, and other receptacles, of glass, porcelain, and earthenware, and in the machinery connected therewith.

1147. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

1148. William Roper. Improvements in shaping and ornamenting sheet metal.

1149. Jean Louis David. Certain improvements in the manufacture of woollen fabrics.

1150. Peter Fairbairn and Samuel Renny Mathers. Certain improvements in machinery for carding flax, hemp, china-grass, and jute, and the tow of the several materials before mentioned.

1151. James Davis. Improvements in machinery for manufacturing bricks and tiles.

Dated December 24, 1852.

1152. Fulcran Peyre and Michel Doloques. Improvements in machinery for dressing woollen cloth.

1153. John Hinks and George Wells. A new or improved penholder.

1154. John Lowther Murphy. An improvement in drawing off liquids from barrels and other vessels.

1155. Joseph Burch. Certain improvements in machinery for reaping, loading, stacking, and storing grain and other agricultural produce.

1156. Joseph Burch. Certain improvements in machinery applicable to thrashing, winnowing, cleaning, and sorting grain, and to other agricultural purposes.

1157. Joseph Burch. Certain improvements in passenger and other carriages.

1158. William Ramsell. Improvements in boilers for generating steam and hot air, together or separately.

1159. Robert Griffiths. Improvements in giving motion to drills.

1160. George Michiels. Improvements in the manufacture of gas.

1161. George Bower. Improvements in the manufacture of gas for illumination.

1162. James Godfrey Wilson. Improvements in the construction of carriages and vehicles for railroads and common roads, parts of the said improvements being also applicable to parts of locomotive engines used on railroads.

1163. Alfred Vincent Newton. Improvements in obtaining and applying motive power. A communication.

1164. Robert Lublinski. An improved joint for umbrella and parasol sticks.

1165. William Tuer, William Hodgson, and Robert Hall. Improvements in the manufacture of textile fabrics, and in machinery or apparatus for weaving, part of which is also applicable to machinery for preparing textile materials.

1166. Pierre Charles Nesmond. Improvements in machinery applicable to the manufacture of ice, and to refrigerative purposes generally.

Dated December 27, 1852.

1167. John Anderson. Heating and ventilating apartments, and for remedying smoky chimneys by a radiant ventilating grate.

1168. George Ingham. Certain improvements in machinery for drawing cotton and other fibrous materials.

1169. John Frederick Gordon. Facilitating the turning of four-wheeled carriages, and bringing the front and hind wheels nearer to each other, entitled the caster axle.

1170. George Fergusson Wilson. Improvements in treating certain fatty bodies.

1171. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

Dated December 28, 1852.

1172. John Mason. Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.

1173. James Darling and Henry Spencer. Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

1174. William Beckett Johnson. Improvements in steam boilers, and in apparatus connected therewith.

1175. Pierre François Giraud. An apparatus for the interior of bonnets, to fix them on the head.

1176. Joseph Gidman. A skate.

1177. Edward Mucklow. Certain improvements in the construction of retorts for the manufacture of pyroligneous acid, or for other purposes of destructive distillation.

1178. Edward Mucklow. Certain improvements in machinery or apparatus for cutting or rasping dye woods.

1179. Edward Mucklow. Certain improvements in preventing the escape or radiation of heat from steam boilers or generators, and also in preserving marine and other boilers from the effects of incrustation.

1180. William Busfield. Improvements in apparatus for combing wool, and other fibrous substances requiring like process.

1181. Ami Bernard and Aimé Koch. Improvements in machinery and apparatus for preparing flax-straw, flax, and certain other fibrous substances, part of which improvements are applicable to machinery for scutching and heckling.

1182. James Webster. Improvements in the manufacture of springs.

1183. Claude Joseph Edmée Junot. Improvements in the mode of producing several metallic substances hitherto unused, and applying them so prepared to the plating of other metals and substances by means of electricity. A communication.

1184. Samuel Clegg. Improvement in apparatus for measuring gas.

Dated December 29, 1852.

1186. John Copling, junior. A safeguard railway signal.

1187. Henry Kibble. A traveller's monitor, or ticket and parcel protector.

1188. John Whichcord the younger and Samuel Egan Rosser. Certain improvements in the mode of burning and applying gas for light and heat.

1189. Benjamin Glorney. Improvements in obtaining and applying motive power.

1190. Samuel John Pittar. Improvements in goloshes or coverings for boots and shoes.

1191. William Edward Newton. Improvements in the manufacture of carpets. A communication.

1192. Archibald Douglas Brown. Improvements in the construction of portable articles of furniture.

1193. William Brown. Improvements in forging, shaping, and crushing iron and other materials, which improvements, or modifications thereof, are also applicable for obtaining and applying motive power for general purposes.

1194. James Edgar Cook. An improved composition for the prevention of the decay and fouling of ships' bottoms and other exposed surfaces.

1195. John Walter Friend. An improved method of measuring and registering the distance run by ships and boats proceeding through the water.

1196. James Power. Silvering all sorts of metals, and of glass.

1197. Auguste Edouard Loradoux Bellford. Certain improvements in machinery for grinding and reducing gold quartz to an impalpable powder, and amalgamating the said ground quartz with quicksilver; the same being applicable also to the pulverizing and washing of ores. A communication.

1198. Auguste Edouard Loradoux Bellford. A new mode of advertizing. A communication.

Dated December 30, 1852.

1199. Thomas Walker. Improvements in apparatus for regulating the speed of steam engines.

1200. Thomas Walker. Improvements in apparatus for regulating the dampers of steam boilers and other evaporating furnaces, which apparatus is also applicable for indicating the pressure of steam or other fluids.

1201. Henry Hutchinson. Improvements in machines for washing bottles.

1202. James Ward and William Burnhan. Certain improvements in machinery for making bricks and tiles.

1203. Robert Stephen Oliver. Certain improvements in waterproof and other garments.

1204. Julius Singer. Improvements in wearing apparel.

1205. William Edward Newton. An improved method of attaching metals to other metals. A communication.

1206. Robert Taylerson. Improvements in shipbuilding.

Dated December 31, 1852.

1208. William Morton Pickslay. An improvement in the blast of furnaces, and which he designates the calorific blast, and which increases the effective power of furnaces. A communication.

1210. David Dixon. An improved arrangement of apparatus for retarding and stopping locomotive engines, tenders, and carriages.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January* 11*th*, 1853.)

64. Henry Richardson Fanshawe. Certain improvements in shawls, scarfs, neckerchiefs, handkerchiefs, mantles, sails or sail-cloth, table-cloths and table-covers, napkins, and umbrella and parasol tops and covers, and in an improved loom for weaving, applicable especially to the said improvements in respect to some of the said articles.

282. John Blair. Certain improvements in the manufacture of waddings, and in the machinery for making the same.

317. William Scholfield and Joseph Pritchard. Improvements in steam boilers.

459. Charles Weightman Harrison and Joseph John Harrison. Improvements in protecting insulated telegraphic wires.

500. Arnold James Cooley. Improvements in the manufacture of artificial leather.

625. John Cameron. Improvements in boilers for generating steam, and in feed-pumps and apparatus connected therewith.

698. Oswald Dodd Hedley. Improvements in getting coals and other minerals.

739. Amory Hawkesworth. Improvements in life-boats.

748. Constant Jouffroy Dumery. Certain improvements in the manufacture of metallic pipes and tubes, and in the machinery employed therein.

780. James Potter. Improvements in machinery for spinning cotton and other fibrous substances.

839. James Higgin. Improvements in the manufacture of certain mordants used in preparing woven or textile fabrics for printing, staining, or dyeing them, and in the mode or method of using the same or other mordants for the said purposes.

918. Joseph Skertchley, jun. Improvements in mangles and mangle-rollers.

944. Page Dewing Woodcock. An improved preparation or pill for medicinal purposes, hereby denominated "Page Woodcock's Wind Pills."

1058. Rudolph Appel. Improvements in anastatic printing, and in producing copies of drawings, writings, and printed impressions.

1071. Thomas Dunn, Hugh Greaves, and William Watts, jun. Improvements in machinery and apparatus for altering the position of engines and carriages on railways.

1095. John Filmore Kingston. Improvements in obtaining reciprocating motion, and in propelling and steering vessels.

1101. Thomas Elliott. Improvements in steam-engines, which are also applicable to pumps.

1107. William East. Improvements in machinery for crushing clods, for dibbling and drilling land, and sowing seeds.

1119. Jean Baptiste Moinier and Charles Constant Boutigny. Improvements in concentrating syrups and other solutions, and in distillation.

1123. Warren De la Rue. Improvements in preparing the surfaces of paper and card board.

1132. Frank Clarke Hills. Improvements in purifying gas.

1134. John Filmore Kingston. Improvements in obtaining motive power by electro-magnets.

1135. William Aspdin. Improvements in the manufacture of Portland and other cements.

1139. John Livesey. Improvements in lace-machinery, and in piled fabrics made from such machinery.

1147. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

1148. William Roper. Improvements in shaping and ornamenting sheet metal.

1149. Jean Louis David. Certain improvements in the manufacture of woollen fabrics.

1150. Peter Fairbairn and Samuel Renny Mathers. Certain improvements in machinery for carding flax, hemp, china-grass, and jute, and the tow of the several materials before mentioned.

1152. Fulcran Peyre and Michael Dolques. Improvements in machinery for dressing woollen cloths.

1161. George Bower. Improvements in the manufacture of gas for illumination.

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1171. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

1182. James Webster. Improvements in the manufacture of springs.

1183. Claude Joseph Edmée Junot. Improvements in the mode of reducing several metallic substances hitherto unused, and applying them so prepared to the plating of other metals, and substances by means of electricity. A communication.

1184. Samuel Clegg. Improvements in apparatus for measuring gas.

1185. Francis Alton Calvert. A universal ratchet drill. A communication.

1191. William Edward Newton. Improvements in the manufacture of carpets.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS UNDER THE PATENT LAW AMENDMENT ACT, 1852.

Sealed Jan. 12, 1853.

15. Joseph Barker.
22. Henry Walker Wood.
31. John Dunkin Lee.
34. Robert Beart.
35. Thomas Huckvale.
39. Felix Abate and John Julius Clero de Clerville.
41. Joseph Barrans.
45. Charles William Rowley Rickards.
47. Stephen Perry.
48. Edmund Morewood and George Rogers.
49. Edmund Morewood and George Rogers.
124. Richard Heighway.
125. Thomas Hunt.
130. Isaac Westhorp.
137. Arthur Jackson.
141. Astley Paston Price.
167. Joseph Faulding.
169. Moses Poole.
243. Samuel Getley.
244. Joseph Westby.
245. William Dray.
247. Christopher Nickels and Frederick Thornton.
271. Joseph Westby.
272. Joseph Hill.
276. Francis Warren.
277. Admiral Earl Dundonald.
278. William Adolph.
295. Peter Ward.
336. Charles Matthew Barker.
337. Henry McFarlane.
357. Thomas Barnabas Daft.
376. Henry McFarlane.
389. James Webster.
390. John Swindells and William Nicholson.
413. Charles Tiot Judkins.
420. John Oliver York.
432. Edwin Heywood.
446. Robert Bird.
448. James Ottams.
464. John Gilbert and Samuel Nye.
469. Robert Hoppen.
480. John Fowler.
481. John Fowler.
482. John Fowler.
483. John Fowler.
491. James Wilson.
509. Charles Watson.
510. John Tayler and James Slater.
621. Bernhard Samuelson.
657. John Melville.
746. Joseph Cowen and Thomas Richardson.
751. Peter Armand Lecomte de Fontainemoreau
762. Joseph Burley.

Sealed Jan. 13, 1853.

36. James Hare.
46. James Stewart.
122. Duncan Bruce.
300. Andrew Crestadoro.
335. Robert Cochran.
507. Felix Lieven Bauwens.
532. John Lee Stephens.
556. Charles Arthur Redd.
702. Joseph Tringham Powell.
755. James Robertson.
778. Henry Vernon Physick.
812. William Crosskill.
856. Richard Dudgeon.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF ENGLISH PATENTS.

Thomas Fields Cocker, of Sheffield, York, wire, steel, and file manufacturer, for certain improvements in annealing or softening metallic wires and sheets of metal; also in reducing, compressing, or drawing metallic wires; also in the manufacture of metal rolls. January 11th; six months.

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RICHARDS AND GROSE'S ORE-PULVERIZER.

RICHARDS AND GROSE'S ORE-PULVERIZER.

(Patent dated July 15, 1852. Specification enrolled January 15, 1853.)

THE improvements introduced by Messrs. Richards and Grose into the machinery for reducing and pulverizing ores, minerals, and stones, are exhibited in the accompanying figure. They consist chiefly in so arranging two grinding surfaces with respect to each other, that the space left between them for the reception of the matters to be reduced and pulverized shall gradually diminish till the surfaces nearly approach each other, according to the degree of fineness required. Whatever may be the variation in the size of the substances when supplied to the machine, they will be found to be uniform, or nearly so, after passing between the grinding surfaces.

The figure is a sectional elevation of a machine constructed with reference to these principles. A A are foundation pillars which support the casing B B, and C; D D is a fixed conical grinding surface which may be made of wrought iron casehardened, or of steel, or of cast iron casehardened, or with a chilled face, and fluted either in straight lines or spirally; *b b* is an aperture between the casing and the cone D, for the admission of water through the pipe *c*, to keep the surface cool when ores are being pulverized in a dry state; *d* is a pipe for the exit of the water. E is a hollow shaft connected with any prime mover. It has keyed to it a grinding-cone F, formed of wrought iron casehardened, or of steel, or of cast iron casehardened, or with a chilled face and fluted in straight lines, or spirally to correspond with the flutes in the fixed cone D, the lower end of the shaft is supported in the socket G. H is an adjusting wedge for the purpose of raising or lowering the shaft when required. I is a cup for the reception of water which flows down through the shaft E into the hollow of the cone F, for the purpose of keeping it cool; *e* is a pipe for the exit of the water. K K is a vessel, for the reception of the pulverized substances. The distance between the revolving and fixed cones is regulated by raising or lowering the shaft E, and with it the cone F, by means of the adjusting wedge H.

The action of the machine is as follows:—Ore is placed in the hopper C, rotation is imparted to the cone F, and the ore falls as it is gradually reduced down the inverted conical-shaped space between the cones D and F, until it falls pulverised into the vessel K, from whence it is from time to time removed. Water is supplied to both the fixed and revolving surfaces to keep them cool, as before described.

THE CALORIC SHIP "ERICSSON."

(Abridged from the *New York Daily Times*.)

The *Ericsson*, taking the name of her inventor, is a first-class vessel combining in her construction many valuable improvements. She is owned by a company of merchants in this city, among whom is Mr. John B. Kitchen. The builders of her hull are Messrs. Perrine, Patterson, and Stack, of Williamsburg. Her engines are the workmanship of Messrs. Hogg and Delamater. The register of the ship is 1,903 tons. Her length is 250 feet, with 26 feet 6 ins. depth of hold, and 40 feet breadth of beam. Her paddle-wheels are 32 feet in diameter, with buckets of 10 feet 6 inches. The decks are abundantly provided with life-boats, ready to be cast off from the davits at a moment's notice. In place of the solitary smoke-funnel commonly employed in steamships to convey away the smoke and gases of the furnace, the caloric ship presents four small tubes, gaily painted in white and gold, rising but 5 feet above the paddle-wheels and only 30 inches in diameter. The two corner chimneys are attached to the cylinders of the engine, and the remaining two protect the hold from the impure and heated air. Beside each pair of these pipes is a "well," extending to the bottom of the ship, through which a current of cold air is carried down to the fire-room, rendering that place as cool and comfortable as the upper deck, and effectually preventing all danger of conflagration from over-heating. Through the open space thus afforded, an additional advantage is given for the working of the force-pumps, the pipes of which are carried up through its entire length.

The descent from the upper deck is accomplished by neat staircases, for which ample space is afforded by the position of the engine-room. The peculiarities of con-

struction of the vessel begin to appear in this region. The compact form of the engine leaves a free space on each side of the ship, from fore to aft, both above and below, thereby affording opportunities for easy transition between all parts of the vessel. The paddle-shaft is concealed between the decks, and offers no obstruction to the midship section of the vessel. The dining-saloons are located aft of the engine, and the state-rooms lie below; easy access to them being obtained by means of substantial and spacious stairways.

The leading peculiarities of the caloric ship, it is well-known, consist in the application of heated air to the propulsion of vessels. The great alteration which is accomplished by this plan in the construction of the engine renders a description of the machinery, unaccompanied by diagrams, a matter of some difficulty. The engine consists of two pairs of cylinders, connected in their action, but not placed side by side. Each pair is composed of two cylinders, of which the lower one is much the larger. The upper is termed "the supply cylinder;" the lower, the "working cylinder." The diameter of the working, or lower cylinders, is 168 inches; of the upper, 137 inches each. Their bore, it will be remarked, is surprisingly large. The position of the cylinders is exactly in the centre of the vessel.

The operation of the engines is remarkably simple. A fire is kindled in the furnaces attached to the lower cylinders, the flames being removed to a distance of about 5 feet from the bottom of the cylinder; so that no actual contact can take place. The application of heat increases the temperature of the air in the lower cylinder which escapes in a series of valves properly arranged for the purpose. The cylinders being each provided with a piston arranged so as to operate simultaneously, the vacuum created by the escape of the air from the working cylinder causes the descent of the lower piston, which, of necessity, draws down with it the piston of the supply-cylinder, and the work of the engine is commenced. A series of valves, each of which is 2 feet in diameter, is placed in the top of each supply-cylinder, and these valves instantly open at the descent of the pistons; a current of cold air rushes in, which passes down, following the piston of the upper cylinder, until it is stopped by the "regenerator"—a contrivance upon which depends the successful operation of the machinery. The air, having entered this regenerator, is converted from a cold into a warm current by virtue of the operation of the simplest philosophical laws.

The invention of the regenerator, at once simple and ingenious, which is the remarkable feature of the engine, is entirely due to the genius of Captain Ericsson.

The apparatus is little more than a series of fine wire nettings of iron, placed side by side, to the thickness of 12 to 20 inches. As the air passes through this mass of metallic surfaces, penetrating through the minute cells formed in the interstices of the wires, it receives a greater volume of caloric, which increases in temperature as the current approaches nearer to the fire beneath. The *maximum* of heat absorbed by the air in this passage through the regenerator is 450°. The *minimum* necessary to be applied from below is 30°, making an aggregate of 480°, at which point the volume of air which has entered the engine is exactly doubled, and by its expansive force sets in motion the crank connecting the machinery, producing a revolution of the shaft, by which the paddle-wheels are revolved, and the vessel is put in motion.

The manner in which these various performances transpire is quite remarkable. As the air passing through the regenerator has performed its work in causing the revolution of the crank—which rests upon the piston of the working cylinder—it is made to re-enter the apparatus by the upward pressure of the now ascending piston. As it passes through the regenerator, in exact reverse order, it loses the volume of heat which it had before acquired and becomes cooler as it approaches the upper surface of the regenerator. It will thus be seen that the regenerator presents two different surfaces—one, or the upper, is the cooler, because most directly opposed to the current of cool air entering the cylinders from above; the other, warmed by the furnaces below, preserving a warm exterior; and by this contrary action the current of air which is alternately drawn through or expelled from it, undergoes essential modifications of temperature. A very small percentage of the whole volume of atmospheric air thus employed is permitted to go to waste. Only a few pounds of coal—anthracite only being used in the caloric ship, both on account of its greater cleanliness and portability—are needed to commence the operations of the machinery. There are no boilers or large furnaces, and the danger from fire can never be so great as to create apprehension; while, as an additional means of security against accident, the entire floor of the engine-room is covered with a corrugated cast-iron pavement, the plates of which are so carefully joined together that the chance coals can neither penetrate to the woodwork, nor the water enter through the interstices left in the bed-plates, as is frequently the case in steamships. A number

of advantages are thus combined, not only in the engine, but in connection with its various appurtenances.

The construction of the furnaces, and the small amount of fuel required to feed them, cause a great saving in the stowage-room of the vessel, by which it gains largely in accommodation for merchandise and freight. The freightage of the ship will be about 1,400 tons. The freight-deck, strongly secured from accidents, is roomy and cleanly. It is perfectly clear from stem to stern, in consequence mainly of the small space occupied by the machinery. The coal-hold is below the freight-deck, and is abundantly spacious to contain the entire mass of fuel required for the outward and return voyages of the ship. It is, in fact, contemplated that the vessel will be able to carry her coals for the longest trips out and back, even should the voyage be extended beyond the customary route of our packet steamers. The coal can not only be procured here with greater readiness, but the stowage of the amount required may be accomplished at one time, and a certain contract may be entered into, by which the owners of the vessel may realize a profitable sort of economy. It is not to be lost sight of, in case the success of the caloric principle shall be definitively established, that the monopoly of the coal trade, for steamer supply, will eventually remain with the American dealers. The steam ships can now carry a supply sufficient only for a single trip. To return to port they are compelled to lay in supplies abroad, and hence one of the ostensible reasons of the expedition to Japan—the necessity of free coaling-stations being felt by the steamers navigating the waters of the China Seas.

[By the last accounts received from America, it appears that the *Ericsson* has made a trial trip, and that she has achieved a speed of 12 knots an hour. This speed, it must be observed, is partially attributable to the favourable state of the wind and of the tide; but the success of the experiment may be judged of from the fact that she answered her helm perfectly.]

Woehler's Analytical Chemist's Assistant. Translated from the German, with Copious Additions by OSCAR M. LIEBER. Sampson Low, Son, and Co.

IN the very numerous manufactures where chemical processes form the great basis of operation, this manual of analysis will be found of extreme value. Originally published at Göttingen, in the year 1849, for the use of students in the laboratory of the Author, who is professor of chemistry in the university of that city, it was found to embrace so extensive a range of practical information within an extremely limited compass, that the translator deemed it worthy of being presented in an English form to the American public. To the scientific and manufacturing community of this country, it cannot be in a less degree serviceable. The course of proceeding in almost every possible state of circumstances is concisely and clearly laid down, according to the existing state of the science, and in the hands of an experienced chemist it is certain to save a great deal of reflection. The work, in short, is precisely one for which a place has long remained vacant in our chemical literature, and it is likely to supply wants arising from this circumstance, which, in practice, are even now constantly experienced. The general plan of the book renders it conveniently available on every question of manipulation for qualitative or quantitative analysis, and the additions made to it by the translator extend its application to a variety of matters not included in the original. He has also written an introduction describing the most general manipulations employed in analysis; and in most instances he has added the results of the analyses performed by the best authorities. In another respect, too, a practical improvement of some value has been effected by his stating the per centages of the ingredients sought, which exist in the compounds obtained, wherever it is impossible to separate the latter without loss. For much of this information the Author acknowledges his obligations to the learned work of Frezenius on Quantitative Analysis. Upon the whole, the book appears eminently adapted to the wants of the manufacturer, and is likely to come largely into use.

THE TRADES OF BIRMINGHAM.

THE London Works at Smethwick—(Messrs. Fox and Henderson)—are in full

employ night and day. The ironwork for the Sydenham Palace, as well as other numerous ponderous structures for all parts of the kingdom and the world, are in course of execution, and give employment to many hundreds of hands. Smethwick, in latter days, seems to be a favoured locality. In close contiguity are the glass-works of the Messrs. Chance, who have obtained the orders for the glass required, not only for the Dublin Exhibition and Sydenham Palace, but also for the roof of the Grand Central Railway-station in Birmingham. This roof will be of larger dimensions than any other in the world. It will be 1,080 feet long, with a span of 212 feet across, and at a height of 75 feet from the rails. The roof will be of fluted glass. The extent and importance of the order received by the Messrs. Chance may be conceived from a consideration of these facts.

In anticipation of a great advance in the price of locks, the factors have issued large orders throughout the neighbourhood of Willinhall and surrounding villages, and the master lock-manufacturers were to meet on Monday evening at Wolverhampton, for the purpose of considering the course to be pursued under existing circumstances.

The copper and the tin trades are in an equally agitated state. Another advance of 5*l.* per ton has been declared upon copper, by one, if not more, of the large houses, within the last few days; and large orders have been refused, even upon that advance, so that manufacturers applied to for contracts are obliged to refuse them, or accept them subject to the price of copper at the time of delivery.

The glass trade is in a very satisfactory condition. The raw material has advanced, and the high price of coal has rendered an advance of manufactured articles indispensably necessary. Every description of glass is now undergoing an advance of price. One large house has already declared an advance, and in the ensuing week the other houses in this town and district will follow. There will be a meeting on the subject in a few days at Stourbridge.

The pistol and gun trades were never known to be brisker than they are at present. It is difficult to obtain the execution of orders at greatly enhanced prices. Agents from various parts of the kingdom have visited Birmingham in the course of the week to make purchases, but neither pistols nor guns in any quantity are to be bought in the town. Pistols, particularly revolvers, are scarcely to be had at any price. The demand is chiefly for the Australian and Californian markets. The sales from the stores at Plymouth, Liverpool, and Southampton, to emigrants, are said to be immense, and the storekeepers who visit Birmingham complain much of the poor supply they are able to obtain.

The scarcity of labour is becoming also a subject of complaint in these districts. Emigration of good workmen places some manufacturers in considerable straits. In the railway-carriage and truck business contractors are obliged to search throughout distant parts of the country to obtain competent artisans to complete their contracts, and in other branches of local trade similar inconvenience is experienced. The local papers abound with advertisements for workmen in almost every branch of Birmingham business.

THE IRON TRADE.

THE quarterly meeting of the ironmasters terminated at Dudley on Saturday evening, and, according to the statements of some of the leading firms, the iron-market at its close was firm at the last advance, and the prospects of the trade cheering. At the meetings held in October the iron manufacture of South Staffordshire presented a very different appearance; great depression at that time existed, and little hopes appeared to be entertained of any immediate change in the aspect of affairs. In order to place the change which has taken place in the strongest possible light, we give the following list of prices declared at the quarterly trade-meetings held in October, 1852, and January, 1853:—

	October		January.
Staffordshire bars	£6 0	...	£11
Boiler plates	7 10	...	13
Hoops	6 10	...	12
Common nail-rods	6 0	...	11
Sheets	7 10	...	13

Pigs at the present time are at from 5*l.* 5*s.* to 6*l.*; three months ago they might have been purchased at half the price or less. It will be seen by the above statement that, within thirteen weeks, all descriptions of iron have advanced fast approaching to cent. per cent. This most extraordinary rise is to be attributed to three causes—an unquestionably increased demand, the cheapness of money, and recent speculations to a very large extent in Scotch and Staffordshire pigs. The circulars of the Glasgow merchants show that there are, or have been, hundreds of thousands of tons in stock awaiting a profitable realization.

The intentions of the Bank of England on Thursday caused considerable anxiety in Birmingham, and had the screw been further applied, which was much feared, there is little question but prices would have gone down. As it was, orders were freely taken, and we heard of bars being offered at 5*s.*

under the quoted list. The reluctance manifested a month ago was not conspicuous on this occasion, and we heard of bars being offered at 5s. under the quoted list. The reluctance manifested a month ago was not conspicuous on this occasion, and we heard of offers made to deliver hoops at Liverpool at 11*l*. 10s. The facts mentioned are given upon competent authority, and show that although the iron-trade of South Staffordshire is in an unprecedentedly prosperous state the present high prices are not so firmly fixed as some parties have represented.

Throughout the meeting the general impression appeared to be that the Bank of England had been induced to raise the discount in order to check what is now considered unjustifiable speculation in the trade, and it was further intimated by persons well informed in monetary matters, that still greater advances would be made in Threadneedle-street, if further attempts were made to force prices.

Glasgow Pig Iron - market. — Glasgow, January 15. — Notwithstanding the firm tone of the quarterly meeting at Birmingham, the price of pig-iron has given way considerably under the influence of the increased demand for money and pressed sales. To - day's prices may be quoted 69s. 6d. to 70s. cash; but buyers are shy, and decline operating in a falling market.

America.—By the steamer, *Canada*, which arrived at Liverpool on Sunday from Boston, with advices from New York to the 4th inst.; we learn that the iron-market of that city was quiet, but firm. Scotch pig was held at 31 dols. to 32 dols. English bar iron was selling at 67 dols. 50c.; Swedish, at 82 dols. 50c.; and English sheet at 4 dols. ½c., six months.

THE ELECTRIC CLOCK.

Sir,—Your last Number contains the notice of a paper read before the Society of Arts by Mr. C. Shepherd, jun., in which Professor Wheatstone is represented as the inventor of the Electric Clock, which, as carried out by Mr. Dent, was exhibited at the rooms of the Royal Society in 1840. "In the succeeding year," says Mr. Shepherd, "Mr. Bain applied for his patent."

Now, Sir, it has been long since incontestibly established, that Mr. Bain first exhibited his electric clock to Professor Wheatstone on the 1st August, 1840—that the electric clock exhibited by Professor Wheatstone to the Royal Society in November, 1840, was not his invention, but that of Mr. Bain—and that Mr. Bain did not apply for his patent "in the succeeding year," but in the previous month!

Such of your readers as may have forgotten the circumstances, or wish to satisfy themselves of the correctness of the foregoing statements, will find in the 39th volume of the *Mechanics' Magazine*, page 64, a minutely-detailed history of the transactions connected with the invention of the electric clock; and at page 70, the final suppression of Messrs. Wheatstone and Dent's attempted piracy, by injunction from the Court of Chancery in January, 1841.

I am, Sir, yours, &c.,

W. Baddeley.

13, Angell-terrace, Islington,
Jan. 17, 1853.

Telegraphs in Switzerland.—The following cities and towns in the Swiss Confederation have just been connected with the Submarine Telegraph Company's wires, Cornhill:

Aarborg, Baden, Bale, Berne, Soleure, Altorf, Friebourg, Geneva, Glaris, Lausanne, Lucerne, Neufchatel, Saint Croix, SaintGall, Schaffhausen, Schwyz, Zug, Zurich, Aaran, Berthond, Bienne, Brugg, Chaux de fond (la), Delemont, Herzogenbuchsee, Langenthal, Lenzbourg, Liestatt, Saint Inner, Sonceboz, Zoffiogue, Alstatten, Airolto, Andermoth, Bellinzona, Brigg, Buhler, Covie, Flawyl, Fleurier, Franemfeld, Herisau, Horgen, Lichtenstein, Locarno, Locle (la), Mogadino, Misocco, Morat, Morges, Motiers, Neiderurnen, Nyon, Ragaz, Rapperschwyl, Rheineck, Richtenschwyl, Rorschad, Sion, Splugen, Tufeu, Thusis, Trogen, Uznach, Vevay, Wadenschwyl, Wattwyl, Wurterthir, Wyl, Yverdun, Chiasso, Lugano.

CROWLEY'S SAFETY SWITCH AND SELF - ACTING RAILWAY SIGNALS.

A system of self-acting safety signals, embracing every contingency in railway traffic, which ought to be provided for, and proceeding upon a principle of operation in its important features, altogether new, has been invented by Mr. Crowley, the son of one of the Directors of the London, Brighton, and South Coast Railway, who is proceeding to obtain letters patent for it.

By this invention it is intended to make every train work the signals, and also fix the switches at any station to which one may be approaching. As any train or truck enters a station, or is shunted on to the line, the flanges of the wheels will depress a lever, which, acting on an electro-magnet, will release a balance-weight, and cause the danger signal to be put up at the station; and also at a distance along the line of from 500 to 600 yards, according to local circumstances. When a train has arrived within that distance of a station, the flanges

of the wheels, acting on a small lever in connection with an electro-magnet, will cause all the switches leading to the line on which the train is advancing to become fixed, so that nothing can thoughtlessly be shunted through them while the train is running from the distance-signal to the station. The switches will remain fixed until the train has passed the station. Should it be necessary, however, to attach any additional carriages to a train standing at a station, they may be released by turning a small handle close to the lever-box. When the signals are at "danger," they will remain in that position until pulled down, so that a neglect of duty will only cause the temporary delay of a train, whereas, under the present system, it might be attended with serious consequences. The cost of application to existing signals, and the expense of maintenance, is inconsiderable.

LENGTHENING OF SCREW STEAM-VESSELS IN THE NAVY.

It will be remembered that some few months ago the idea which prevailed of increasing the ratio of the length to the breadth of ships intended for screw propulsion operated so effectually on the minds of the late Admiralty as to induce them to cut in halves the *Windsor Castle*, 120, now known as the *Duke of Wellington*, 131, and insert in her midships a length of 20 feet. The *Duke of Wellington* was built in Pembroke dockyard, on the same lines as the three-deckers *Prince of Wales*, *Royal Sovereign*, and *Marlborough*, each of which was designed at Somerset-house for a sailing-vessel, to carry 120 guns. The original length of these ships was 140 feet, breadth 60 feet, and depth 65 feet. Without any experience whatever respecting the benefits and advantages to be derived as a compensation for the expense incurred by lengthening the *Duke of Wellington* 20 feet amidships, the Lords of the Admiralty have given orders to lengthen the *Marlborough*, considerably advanced towards completion, in a similar manner. The order for lengthening the *Marlborough* in a similar way, by cutting her in halves, was carried into effect on Saturday morning in Portsmouth dockyard, in the presence of Rear-Admiral Fanshawe, C.B., superintendent; Major-General Simpson, the Lieutenant-Governor; and numerous other naval, military, and civil officers.

The operation of cutting a ship in halves and moving the stern 20 feet from the forepart of the vessel is remarkably simple. The groundway and bilgeway are prepared exactly in the same manner as if the ship was about to be launched, the only difference is, that after the keel and ribands are entirely separated or cut at midship, dividing the hull into fore and aft parts, there are two strong chain cables attached to the after part, by which it is allowed to recede slowly from the fore part, and, therefore, a perfect command of the motion of the ship is by this means readily obtained. The whole performance did not occupy more than a few minutes, and all present appeared to be delighted with the manner in which the process had been conducted. The mass so easily moved weighed upwards of 200 tons.

LAUNCH OF H. M. SCREW STEAM-FRIGATE "TRIBUNE."

The screw steam-frigate *Tribune* was launched from the dockyard at Sheerness on Friday afternoon last, in the presence of a large concourse of spectators, including several distinguished members of the service. All the workmen belonging to the yard, except those immediately engaged for the launch, left at 1 o'clock at noon, and at 2 o'clock the yard-gates were thrown open to the public. By 3 p.m. several thousand people had availed themselves of every situation eligible to get a sight of the launch. Vice-Admiral the Hon. Josceline Percy (Commander-in-Chief at the Nore), Captain the Hon. Montagu Stopford and family, Mr. Jonathan Aylin (master-attendant), Lieutenant-Colonel England, R.A., also Captains Dalton, Dunlop, and Mercer, R.A., were among the officers present.

The *Tribune* is to carry 30 guns, and have engines of 300 horse-power. She was to have been launched on an earlier day, but the boisterous state of the weather prevented it.

Preparations having been made in the morning for the launch, by relieving her from her shores and letting her rest in her cradle, immediately afterwards the splitting out of her blocks was commenced, until only the eight foremost blocks remained, these blocks being left to be tripped in launching. The arrangements for christening the vessel were made by Mr. Samuel Read, assisted by Mr. Joseph Large, assistant-master shipwright, and the foremen, Messrs. Netherwood and Thornton, and the ceremony itself was performed by Miss Stopford, the daughter of Captain the Hon. Montagu Stopford. Immediately after the band of the Royal Dockyard Battalion played the national anthem; Mr. S. Read, the master shipwright, gave orders to "stand by." At a given signal both dog-shores were knocked away, and this splendid specimen of marine architecture gra-

dually and gracefully glided into the sea, amidst the hearty cheers of thousands of spectators.

The following are the dimensions of the *Tribune*:

	Ft.	In.
Length between the perpendiculars	192	0
Length of keel, for tonnage . .	163	5¼
Breadth, extreme	43	0
Breadth, for tonnage	42	6
Breadth, moulded	41	10
Depth in hold	12	11
Burden in tons .	1,570	35·94
Horse-power . .	300	

Mr. Charles Pope, assistant-master, attended by seamen-riggers, was on board the *Tribune* at the time of her being launched; 30 of the latter remained on board under the directions of Mr. Pope, and immediately she was fairly clear of the basin entrance, and to the extent of her hawser, the *African* and *Monkey* steam-tug vessels ran up alongside, and at 4·15 p.m. she was towed out of harbour for Woolwich. Mr. W. S. Barnes, Queen's pilot, of Woolwich, on his arrival here with Her Majesty's steam-frigate *Impérieuse*, was retained by the Captain-Superintendent here to pilot the *Tribune* to Woolwich, which he has done.

LAUNCH OF THE "GRANITE CITY."

One of the first clippers yet built was launched from the building-yard of Messrs. Walter Hood and Co., Aberdeen, last week. She was named the *Granite City*, and is intended for the India and China trade. The *Granite City* is of the following dimensions:—Length of keel, 155 feet; rake forward, 18 feet; rake on stern-post, 8 feet; length over all, from taffrail to figure-head, 193 feet; extreme breadth, 31½ feet; depth of hold, 19 feet, and measures 806 tons by the old rule, or 771 tons by the new rule of measurement, and is estimated to carry 1,400 tons. By this model the advantages of quick sailing and large burden are combined, and it will at once be seen that the new mode of measurement affords the greatest facility for the construction of ships on this principle. Under the old system of measurement it was the interest of the owner to build his ships as high and square as possible, so that they might register on a low figure and carry a large burden, and this was done to an extent which kept our mercantile marine far behind that of other nations where no such restrictions were laid down or insisted on; but by the new mode of measurement encouragement has been given to construct sharper ships, and it is the peculiar property of the clipper model after which the *Granite City* has been built to realise the advantages of this law of registration to an extent far beyond that of any other model which has yet been designed.

Iron Ship-building on the Tyne.—The building of iron ships has become quite a staple trade of this district. On Tuesday an iron sailing-vessel, the *Swarthmore*, of 1,100 tons, the largest yet built on the Tyne, was launched from the building-yard of Messrs. Coutts and Parkinson, at Willington. She was built for a Liverpool firm, and is to be employed as an Australian emigrant-ship. Her owners, who are members of the Society of Friends, instead of giving money for a carouse, which is often the case after a launch, contributed 50*l.* towards a school for the education of the workmen's children. Tea and coffee were provided in the moulding-room. On the day following an iron steam paddle-boat, of 530 tons, the *Guanabara*, was launched from the yard of Messrs. Miller, Ravenhill, and Salkeld, of Glasshouse-fields, Ratcliff, who within the last year or two have formed an establishment on the banks of the Tyne, at Low Walker, on account of the great facilities afforded here for iron ship-building. This firm have just commenced the building of a large iron vessel for the Australasian Pacific Mail Steam-packet Company, to be called the *Menura*. She will be 263 feet long between perpendiculars, 34 feet 10½ inches in beam, 30 feet deep in the hold, and of 1,600 tons burden. She will probably be ready for launching in the summer. Orders have been received by another eminent iron shipbuilder on the Tyne for the construction of an iron screw-steamer to trade between Preston and Ireland. She is to be of 300 tons burden, and her engines will be of 50 horse power.

MR. FARADAY'S JUVENILE LECTURES.

The closing lecture of Mr. Faraday's series of Lectures to the Young was delivered on Saturday to a very large assembly of young persons and adults, at the Royal Institution.

A considerable portion of the course having been occupied with illustrations of the action of the atmosphere upon carbon and hydrogen, on this occasion the lecturer concluded his remarks and experiments on that subject. The combustibility of sulphur and of phosphorus was exhibited experimentally, and the experiments terminated with the action of oxygen on both substances. The importance of phosphorus as an element in the fabric of the human body, and its necessary presence in the vegetable

kingdom, in order to replace animal waste, was dwelt on at great length, and illustrated by experiment. Sulphuric acid was now considered as the most energetic of what are termed the acid powers. To show the power of this substance, a blue liquid in a large bottle was by the application of one or two drops of the acid changed into a red one. With the same view were exhibited experiments, showing the influence of sulphuric acid in destroying ammonia, and in charring wood. The lecturer then proceeded to speak of the metals, of which he chiefly desired to show the combustibility. Iron was a very combustible substance; so combustible that but for one little circumstance, the Crystal Palace would have burnt spontaneously, in consequence of the large share which iron had in its composition. The combustibility of zinc was then shown by experiment; some shreds of that metal, in the form of a tassel, when placed in a jar of oxygen burning like paper. The combustibility of iron was illustrated by the friction of steel. Copper and tin were burnt at a small charcoal furnace. Antimony, after burning for some time at the same furnace, was thrown down upon a white frame which lay upon the floor, where it continued to burn in globules until it was consumed. A similar experiment was performed with iron. Such bodies as carbon when burnt, produced substances of a volatile nature, which mingled with the atmosphere; but as soon as burning metals had cooled they assumed a condensed and even solid form; so that lead for example, after being consumed left behind it, in the form of oxide of lead, a substance weighing more than the original one.

Mr. Faraday illustrated these interesting subjects by a profusion of other experiments directed to their minor details, and concluded by expressing the hope, so characteristic of his ardent devotion to the culture of philosophy, that what his juvenile hearers had heard might prove the foundation of a progressive acquaintance with the science of chemistry.

ALLAN'S ELECTRO-MAGNETIC ENGINE.

Sir,—Feeling the greatest interest on everything connected with Electro-magnetism, permit me to express my gratification in reading the paper on Mr. Allan's invention inserted in the Number of your Journal for Saturday last. The only difficulty in bringing this most simple, efficient, and safe power to bear upon machinery generally, is the prejudice of practical men, arising, in many instances, from the faulty experiments of Messrs. Hunt and Joule,—experiments unquestionably satisfactory with reference to one particular case, but leading to the greatest errors as applied to the only methods which will in future be employed for the purposes contemplated. In a model which I have recently constructed, I can with ease produce from 700 to 900 strokes in a minute; and not only is the consumption of zinc very trifling, but not a grain of zinc is consumed without doing efficient duty.

The cause of electro-magnetism would be materially advanced, if all the inventors of rational machines could be induced to concentrate and unite their efforts. Of course one plan, and probably one plan only, will eventually be found the best, and the inventor of this plan would right fully claim the largest reward: but the advantages of assistance in details from others, would fully compensate for the sacrifice of a share of his property. Acting on this conviction, I am perfectly willing to give up a portion of my patents for the purpose, and have long since had the pleasure of making such a proposal to Mr. Harrison.

I am, Sir, yours, &c.,
Geo. Kemp, M.D.,
Cantab.

Chiswick, Jan. 12, 1853.

LOVER'S SYPHON.

Our notice of the syphon invented by Mr. Lover, of Dublin, has attracted the eye of Mr. John Ambrose Coffey, of No. 4, Providence-row, Finsbury, who claims priority of invention in the matter, and states that a considerable time back he tried it on various fluids, and that on the first day of the new law he took steps to procure a patent for it. A notice of his intention to proceed appears in No. 1528 of the *Mechanics' Magazine*. On the other hand, there is no doubt that this ingenious contrivance is an independent invention on Mr. Lover's part, who appears not to have been aware that Mr. Coffey was engaged in perfecting the same instrument. A correspondence has ensued between these gentlemen, in which Mr. Lover readily consented to abandon his claim to the invention, provided it should turn out upon examination that Mr. Coffey's syphon was provided with the elastic bag. Mr. Coffey states that his provisional specification distinctly describes this feature of the contrivance, and the question of title must consequently be considered as settled in his favour.

London and North-Western Railway.—We understand the Directors of the London and North-Western Railway are taking measures to apply to their trains the best practical communication between the guard and driver.

The Egyptian Steam Frigate Faid Gihad.—The Pasha of Egypt's new iron steam-frigate *Faid Gehad* arrived at Alexandria in 68 hours from Malta—the shortest passage hitherto made from that island being 80 hours. This steamer has been much admired by all who have seen her; but Abbas Pasha's curiosity has not been exeited, and, instead of coming down to Alexandria to inspect her, he has started on a tour of inspection to the upper country. She reached Alexandria in the week preceding the 6th instant.

Royal Polytechnic Institution.—A special general meeting of the proprietors of this Institution was recently held, to determine upon the new by-laws in connection with a supplementary charter just obtained, by which each 100*l.* share has been converted into ten 10*l.* shares, a holder of two shares having a free admission for himself at all times; the effect of which will no doubt be, that the proprietary will be greatly extended, and the Institution proportionately benefited thereby.

APPLICATION OF THE PROCESS OF *DEPLACEMENT* IN MANUFACTURES.—PART I.

BY A PRACTICAL CHEMIST.

The applications of science to the most ordinary operations are daily becoming more numerous, and the signs of progress are fully as observable in the improvement of old processes as in the contrivance of new. From the earliest ages the active principles of the vegetable world have been, to a certain degree, obtainable, apart from the inert mass by whose organization they had been secreted. Fixed oils, the juices of fruits, and other fluids have been produced by pressure, often aided by heat; essential or volatile oils, and some other educts, by distillation; and resins, gums, alkaline and saline secretions, colouring matters, &c., by infusion, decoction, and maceration. Of these the familiar examples are the brewery, the tan-yard, the dye-house, the pharmaceutical laboratory, the domestic kitchen, and—though last, not least—the tea-table, "with its hissing urn," or humming kettle. Many of these operations have retained all their ancient simplicity, some accompanied with a sad loss of material and great deterioration of quality. It is to this circumstance that we are now directing attention, in the hope that, by a short notice of the subject, we may indicate a mode of proceeding likely in some measure to place upon a philosophic foundation the very simple process of obtaining from vegetable structures, by infusion or maceration, all the active principles they may contain.

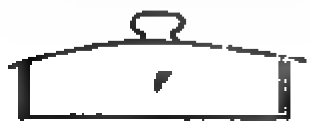
The teapot is, perhaps, the most familiar example of an infusory or macerating apparatus, and its operations are so generally satisfactory, that little or no consideration has been given to it beyond the inflexible condition that it must be supplied with water at the boiling point, after having its own temperature raised by a preliminary rinse of the same. This is, so far as it goes, a wise provision; yet the teapot is, after all, but a slovenly and wasteful apparatus.

Coffee being rather a more refractory material, the coffee-pot has undergone a variety of modifications, and amongst these will be found a near approximation to the only rational mode of proceeding in its own case, and which, indeed, is a fair example of the operation now under consideration. The manufacture of the coffee infusion, without waste of the berry by using more than is necessary, without dissipation of its aroma, upon which its flavour mainly depends, and in a state of perfect limpidity, requires that the water should be at a temperature of 212 degrees when the coffee is submitted to its action; that actual boiling should not take place during the infusion; and that the inert woody fibre and other residuary matter should on no account either remain suspended in the infusion or be in contact with it in any other way—first, because a temperature lower than 212 degrees will not exhaust the coffee of the principles we wish to obtain; secondly, because a continuance of that temperature would soon dissipate the aroma or volatile principle; and thirdly, because a continued infusion upon the exhausted grounds would impart an earthy and disagreeable flavour.

How, then, are these effects to be assured? The French percolating coffee-pot is the modification to which we have alluded as being a near approximation to the form of apparatus essen-

tial to our purpose, and which, doubtless, answers all the conditions we have just now insisted upon.

The accompanying figure is what was designated, some thirty years ago, by its inventor a French *pharmacien*, an *appareil déplaçant*, or displacing apparatus, which has sometimes, though improperly, been known in this country as a "percolating apparatus."



It is composed of an outer vessel A, of a cylindrical form, open at the top, with a concave bottom, from which proceeds a tube terminating in the stop-cock E. B is also a cylindrical vessel, of such a size as to drop easily within the vessel A. It is open at top, and is provided with a perforated bottom C. D is a perforated diaphragm, detached and moveable, but fitting loosely in the vessel B. F is the lid, with a chime, or descending edge, which should either drop between the two cylinders, when the lid is on, or within the vessel B. This arrangement is necessary in some cases, where it may be advisable to lute the lid in its place.

In most cases the best material for the construction of this apparatus is copper; the vessel A and the lid F to be well tinned on the inside, and the vessel B on both sides. The bottom C and the diaphragm D should be of tinned copper, finely perforated. In other cases, when the deplacing fluid or menstruum would have a destructive reaction upon the apparatus, stoneware or glass must be resorted to. In the larger operations, wooden vessels, under any modification which keeps the same principle in view, may be economically adopted.

[Want of space obliges us to divide the paper at this point, and to reserve the remaining portion of it for our next Number. It will treat of the application of this principle of operation in several manufactures which depend upon the successful performance of processes essentially chemical, and point out the considerations of temperature, menstruum, &c., necessary to be borne in mind.]

INSTITUTION OF CIVIL ENGINEERS.

At the ordinary weekly meeting of the Institution, held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair, the evening was entirely devoted to the discussion of Mr. Burt's Paper "On the Preservation of Timber."

The theory of the various processes was carefully described; the action of the solutions in water of metallic salts, such as chloride of mercury (Kyan's), chloride of zinc (Burnett's), or sulphate of copper (Margary's), was, if the mixture was sufficiently strong, to coagulate the albumen in the sap; but the fibre was left unprotected, and it being a property of albumen to render innocuous the corrosive sublimate combined with it, the marine worm, or the white ant would immediately attack wood so prepared.

Creosote had the same effect of coagulating the albumen, whilst it gave a waterproof covering to the fibres, prevented the absorption of water, and was so obnoxious to animal life, that hitherto no instance had been adduced of well creosoted timber having been either touched by decay, dry rot, or the marine worm; and the trials made in India showed that it was equally objectionable to the white ant.

The chemical products of the distillation of coal tar were described, and it was shown that the napthaline was essential as an antiseptic; that the process should be carried on with heated creosote, in order that this product should not crystallize in the capillary tubes of the wood, and that it would be advantageous to dessicate the timber before it was submitted to the process, for which purpose it was proposed to dry the wood by smoking it in an oven, whence it should be conveyed, on the same trucks, into the cylinders, exhausted to the extent of 26 or 27 inches of mercury, and then saturated with heated creosote, under a pressure of 120 lbs. to 150 lbs. per square inch. Wood thus saturated to the extent of 7 lbs. or 10 lbs. per cube foot, might be presumed to be indestructible, as when even by a less perfect process such an extent of saturation had been attained, no authentic instance of decay, or injury from worm, had ever been adduced; numerous specimens of wood so prepared, that had been under ground and in the sea for from twelve to twenty years, were exhibited, and all were perfectly sound.

The alburnam or sapwood absorbed the creosote more readily than the heart of the timber, which could, however, be penetrated by the solution of chloride of zinc (Burnett's process), of which it was stated that careful analysis demonstrated its intimate combination with the timber; it was, therefore, suggested that in cases where the complete preservation of the timber was of vital importance, and expense was not a consideration, the wood should be first subjected to Burnett's process, and then be creosoted, by which combined means it would become indestructible.

It was shown that dry wood only should be subjected to creosoting; by that process sapwood, otherwise almost useless, could be rendered very serviceable; and that for piles for marine work, whole round timber should be used, because the outer portion, or the alburnam was so much more readily saturated with the oil, and this prevented the worms from making an inroad into the heart.

Timber should not be kept floating in ponds, as in London, but it should be stacked in the docks, as in Liverpool and Gloucester; when the tubes were filled with moisture, no oil could be forced into them, even by the heaviest pressure.

By returns from the Leith Harbour works, it was shown that the average quantity of creosote absorbed by the timber was $57\frac{1}{2}$ gallons per load, or 577 lbs. weight forced into 50 cubic feet of wood.

Piles, 14 inches square, of unprepared timber, at Lowestoft Harbour, were shown to have been eaten away to 4 inches square, in four years; whilst creosoted piles, of the same dimensions, driven alongside them, were perfectly untouched; specimens of both were exhibited.

Some specimens were shown of curious coke, produced from the pitchy residue of the distillation of creosote; it was quite free from sulphur and earthy particles, and was found to be very valuable for smelting iron, for which purpose it was beginning to be largely used near Birmingham.

It appeared to be admitted that all the various processes somewhat reduced the transverse strength of the timber when dry, and the metallic salts affected at the iron bolts, or fastenings.

The natural juices of some woods did this; and a bolt was exhibited which had united beams of elm and pitch pine, and was corroded entirely away at the junction.

It was shown, that on some railways in the North, unprepared yellow pine had been down, as longitudinal sleepers, for sixteen years, and was still perfectly free from decay, although its natural term had expired, by being crushed under the loads constantly travelling over it. The effect of "Greenheart" timber in resisting the attacks of worms, was particularly noticed, and it was admitted, that but for its great cost, it would be extensively used.

Experiments were mentioned, that were made at the Royal-pier, Southampton, on timber prepared by various processes; and the result was that the creosoted wood alone resisted the attack of the "Terebrans" with which that water was peculiarly infested.

The members were requested to aid Mr. Burt, the author of the Paper, in some further experiments, whiche he had undertaken on the subject, and to communicate to the Institution all information which could elucidate the various points treated of in the Paper, or alluded to in the discussion.

The following Paper was announced to be read at the Meeting of Tuesday, January 25th, "On the Construction of Fireproof Buildings," by Mr. James Barrett, Assoc. Inst. C.E.

SOCIETY OF ARTS.

The Seventh Ordinary Meeting of the Society was held on Wednesday the 19th instant, Henry Thomas Hope, Esq., Vice-President, in the chair. A paper was read by M. Claudet, "On the Stereoscope and its Photographic applications." M. Claudet having given a brief history of the discovery of Professor Wheatstone, and of the investigation of Sir David Brewster, relative to the various phenomena of binocular vision,

pointed out the improvements which the latter gentleman had made in the construction of the stereoscope by the addition of two semi-lenses; he observed that the discovery had lain dormant, or at all events had not been applied to photographic purposes, until M. Duboscq Soleil, an optician of Paris, took up the invention, at the instance of Sir David Brewster. He then gave a description of the human eye, and showed how the impression of all objects viewed by the pupil was conveyed to the sensorium of vision. He wished to prove, that as the various pencils of light coming from different points of an object crossed each other, and were imprinted upside down on the retina, that the principal sensations of vision were the result of habit; and these sensations might easily be varied by altering the manner of their perception. Single vision by means of two eyes was due to the property by which similar parts of the two retinæ united to compose on the mind a single impression of the same image. The brain was never sensible of perceiving an object single, unless the axes of the eyes were directed on that object, when the image was imprinted on each of the retinæ exactly opposite the pupil, all other objects appearing double. The double image of nearer objects than the one giving single vision, were represented one on the left eye, on the left of the axis of a supposed sphere, and the other on the right eye, on the right of that axis.

Photography alone could produce images perfectly identical to the images on the two retinæ; and if these could be placed so that the right perspective was seen only by the right eye, and the left perspective only by the left eye, there would be the same representation on each retina, as if the natural objects were viewed. This was precisely what the stereoscope enabled us to do. If two views of the same object, one similar to that which would be seen by the right eye alone, and the other similar to that seen by the left, were placed under each eye respectively, then by means of two prisms they would be refracted on the two retinæ in the planes where they coalesced. But they do not coincide in all their parts any more than the natural images for their various planes, and as in natural vision we were obliged, in surveying the stereoscopic pictures, to alter the convergence of the optical axes, according to the various places they represented.

One of the most remarkable observations to which Mr. Claudet referred was the singular similarity of effect between squinting outwards and the stereoscope, and squinting inwards and the pseudoscope.

He showed two exactly similar pictures placed in the stereoscope produced less relief than one of these pictures seen alone with one eye, proving that it was from the gradual coalescence of the various planes of binocular pictures that the sensations of relief and distance were obtained. From this fact he proved that paintings could never represent the distances and relief of nature or stereoscopic vision, which was the representation of one perspective projection only. Paintings, he said, should never be inspected except with one eye. For this reason he thought that the double conical tubes used in picture-galleries should be discarded, and that a better perception of distance and relief would be obtained in looking through a single tube with one eye.

The Iron Screw Steamer "Bengal."—The Peninsular and Oriental Steam Navigation Company's new iron screw steamer *Bengal*, Captain Powel, arrived at Southampton on Sunday from the Clyde, and is to be got ready at once for the Southampton, Malta, and Alexandria mail service, and will start from Southampton, on her first voyage to the Mediterranean, on the 20th of February. The *Bengal* is the largest screw steamer and the longest ship that has ever entered the Southampton Docks, and in every way a noble vessel, her tonnage being 2,300, and horse-power 450. During the passage from Scotland, her performances were very satisfactory, although the weather was most unfavourable. The *Bengal* is reported to have made a speed of more than 12 knots in slack water, and to have steamed 8 knots against a heavy head wind and troubled sea. This is, we believe, the greatest speed ever achieved by a screw propeller, and it is confidently expected that the *Bengal* will, under ordinary circumstances, run from Southampton to Alexandria in 11 to 12 days, including stoppages.

THE WATER-SUPPLY QUESTION.

In a paper by Mr. G. R. Burnell, C. E., on the Spanish province of Orense, Gallicia, which was read before the Institute of British Architects last month, we find the following remarkable observations on the influence of soft water on animal and vegetable life, which are worthy of attention on account of their intimate relationship with the important question of the water supply. Mr. Burnell says:

"One very interesting observation is to be made with respect to the general character of the fauna of this part of Spain (and which confirms other observations I have made in different parts of England and Scotland), viz., that the invariable softness of the waters is prejudicial to animal life. As the Board of Health have taken upon

themselves to assert, in contradiction to every authority who has treated the subject of the physiological action of water upon the human frame, that soft waters are the best and most wholesome, it is important that the public should be informed of everything wherein their theories appear to be exposed to doubt. I therefore now proceed to relate my own observations upon the countries in which soft waters only are to be found, in the hopes of calling forth other and more valuable inquiries.

"I have noticed in Spain, in the granitic regions near Plymouth in England, and Cherbourg in France, in the mill-stone grit districts of Yorkshire, and in some parts of Scotland, that the glandular affections are very prevalent. In Gallicia it is notorious that no cavalry regiments can be kept, because the hay is not of a quality able to support the horses; and generally speaking the race of horses used in the country is of a very inferior description, and maintained with difficulty. Singularly enough this fact is confirmed by the observations made by the cavalry officers stationed at Guildford during the last war, as recorded in 'Britton and Brayley's History of Surrey.' It was found, in the latter case, that the hay obtained from fields irrigated with soft waters from the Bagshot sands—the precise source recommended originally by the Board of Health—was positively injurious to the horses, and it was finally excluded from the barracks. There is in the streams of Gallicia a remarkable scarcity of fresh-water shells, and I have observed the same fact upon the silicious sands of the Bagshot Heath, and in the mill-stone grit districts of Yorkshire; it would appear, in fact, that this class of animals cannot obtain in those districts the materials necessary for the secretion of the elements of their external skeleton. Some valuable plants, (such as the water-cress, the trefoils, lucernes, &c.,) are entirely wanting in the soft water regions; whilst upon human beings the effects produced by an absence of calcareous matter in the waters are as decidedly characteristic of a low tone of the system, as those produced by too great a proportion of that substance are characteristic of an excessive development of the sanguine temperament."

[These observations are in perfect unison with the well-known circumstances of those localities in which goitre, or scrofulous enlargement of the glands of the neck, is the prevailing malady. In all Alpine regions, more or less of this distressing deformity is observable, and the cause has been very generally referred to the habitual use of snow-water, which of course can be but slightly charged with mineral matter of any kind. When we consider at the same time that the geology of these regions is almost entirely primitive, we may assure ourselves that the spring-waters are there equally deficient of lime, though not so of other earths; such, for example, as magnesia and alumina, neither of which can replace lime in the animal economy. Scrofula, in some one of its many forms, will be found to be abundant in all districts exclusively of a primitive formation; the Channel Islands, for example.

At this time these facts deserve much consideration. The search for a fitting supply of water to the millions of London may be said to be now at its height. Ignorance and cupidity have both been charged, and properly so, with present defects, both as to quality and quantity.* Let care, however, be taken in all attempts to remedy these defects, first to ascertain what are, and what are not, impurities in alimentary water; and if it be found, as it probably may, that Nature presents us the beverage from her own bosom not in an impure, but in a duly medicated state, that would be worse than a fastidious refinement which should reject the slight addition she has made in the recesses of her own laboratory, for the benefit of her creatures.]

THE EXHIBITION OF PHOTOGRAPHS AT THE SOCIETY OF ARTS.

This magnificent collection of examples of the photographic art, which has attracted several thousands of spectators to the rooms of the Society, has just been enriched by a contribution from the Earl of Granville of twenty-one sun-pictures taken at Venice. These productions are all of them considered remarkably successful. The Exhibition closes on this day week, the 29th inst.

THE PROJECTED PHOTOGRAPHIC SOCIETY.

On Thursday evening, an inaugural meeting of photographic amateurs was held at the Society of Arts, for the purpose of discussing the preliminaries of the formation of the contemplated Photographic Society. The great point under consideration was whether the Society should be constituted as a branch of the Society of Arts, among whose members the idea was originated and matured, or whether it should be made an independent society. The advocates of the former alternative contended that the Society's rooms and officers being available for the business of the contemplated society, it would be extremely impolitic to incur the heavy expenditure of taking offices and en-

gaging officers for no adequate advantage. On the other hand it was urged, that though this offer had been made on the part of the Society of Arts in a spirit characteristic of its devotion to the culture of science and art, its premises and its officers were already sufficiently burdened with the business incidental to the numerous objects the Society was carrying out, to render such an arrangement desirable. It was ultimately determined that the Society should be formed upon an independent basis.

THE SEWERS COMMISSION AND THE SEWAGE GUANO COMPANY.

Since we adverted in a recent Number to the inaction of the Sewage Guano Company, and remarked upon the probability that it was owing to the want of facilities which the Commissioners of Sewers might and ought to have afforded, the subject appears to have attracted considerable public attention, and a correspondence has been published which completely realizes our anticipations. The Commission have abruptly refused to Mr. Dover, the Company's Manager, and whose patent forms the basis of their projected operations, the grant of the sewage of an outlying sewer, to begin upon publicly. A request so humble, so perfectly harmless in its nature, and promising to be attended with such important results to society, might at least have beeen reserved for consideration, especially as Mr. Moffatt, Mr. Stothert, and other gentlemen have been deemed worthy by the Commission of such an opportunity being afforded them.

Without attempting to contrast the relative merits of these different schemes for treating the sewage, it is sufficient to observe that the subject is one which involves numerous difficulties, both in theory and in practice, and that no expedient should be left untried which promises to be successful. If the Sewer Commission were sincerely anxious for the perfect accomplishment of the public objects for which they were appointed, they would give indications of being alive to this circumstance, which are not to be found in their general administration of affairs. So long ago as the 4th of June last, Mr. Dover applied for the grant of the sewage of the Ravensbourne sewer for a term of years, which the Commission declined, on the ground that they were not in a condition to enter into such an arrangement. On the 11th of September, Mr. Dover renewed his application, and asked for the diversion of a portion of the sewage of the Northumberland-street sewer. He was again unsuccessful; the Commission departing from the practice of granting it, which in some other instances it had followed. The Commissioners, however, have added to their refusal the following invitation, "If you will select a sewer suited to your object in an outlying district, the Commissioners will be hapyy to treat with you." The Ravensbourne was precisely such a sewer, and it had been refused but a few months previously.

Inconsistency of conduct so glaring destroys all confidence in, and all respect for, the public body that is guilty of it, and only serves to show that irresponsible power has been abused. In the meanwhile the public are shut out from a great benefit, which may be within reach, and well-meaning individuals are exposed to unmerited injuctice. For the sake of progress in the cause of the public health, no less than for the credit of a Commission upon whom such important trusts devolve; we hope soon to hear that this obstacle is removed, and that the Northumberland-street sewer is placed at the disposal of Mr. Dover.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JANUARY 20, 1853.

John Henry Johnson, of Lincoln's-inn-fields and of Glasgow, gentleman. *For improvements in steam-engines.* (A communication. Patent dated July 6, 1852.

These improvements have relation to steam engines working expansively, and consist in arranging the cylinders of such engines in such manner that the steam, after having actuated the piston of a small cylinder, shall be admitted alternately into two larger cylinders, whose pistons it shall move by its expansion, but through a stroke equal only to half the length of that of the smaller cylinder. The motion of the three piston rods is taken off by any suitable means, and applied as desired; and this arrangement of the cylinders is adopted whether they are stationary or oscillating.

Moses Poole, of London, gentleman. *For improvements in reaping and mowing machines, and in pulverizing land.* (A communication.) Patent dated July 6, 1852.

The "improvements in reaping-machines" consist in a mode of arranging the cutters and guard-teeth of such machines in such manner as to prevent the cutters being clogged by any accumulation of cut matters within the guard-teeth, which are made double, one portion being above, and the other below the teeth; and this object is effected by cutting transverse grooves or recesses across the teeth immediately under the cutter-bar, and attaching pins to the

under side of the bar, so as to work in the recesses when the bar is vibrated, and thus keep them clear, and prevent any portions of the cut material working in so as to impede the action of the cutters.

The "improvements in mowing-machines" consist of a peculiar combination of parts forming a machine for this purpose. This machine consists of a platform having a vibrating set of cutters with guard-teeth of the kind just described along its front edge. The platform runs on wheels, and motion is given to it and to the cutters by suitable gearing fixed on a vertical pillar on the frame, and set in motion by a winch-handle which is worked by the attendant, who stands on the platform while the machine is in action.

The "improvements in pulverizing land" consist of an arrangement of thin parallel discs, having intermediate scrapers for removing the earth from them as they revolve, mounted on a horizontal shaft of any required width, which is carried by suitable bearing-wheels. The discs are so arranged that their depth of cut can be regulated at pleasure.

FREDERICK SANG, of Pall-mall, artist in fresco. *For certain improvements in machinery or apparatus for cutting, sawing, grinding, and polishing.* Patent dated July 6, 1852.

The improvements claimed under this patent consist principally in using two or more endless saws, moving in a rectilinear path, whether parallel to each other or not, for sawing purposes, and in adopting similar arrangements for cutting, and this whether for stone, &c., or for cutting grain. The grinding and polishing is also effected by endless webs, carrying suitable surfaces to act on the materials under operation.

FREDERICK GESSWEIN, of Canstadt, Wurtemberg, stone-mason. *For a method of preparing for baking and burning masses of clay of any given form and size, and baking and burning the same, when so prepared, as thoroughly and completely as a common brick can now be baked or burnt.* Patent dated July 6, 1852.

These improvements consist in perforating masses of clay, whether in the shape of cornices, capitals, pillars, &c., whilst in the moulds, and previous to burning, so as to force the clay more thoroughly into the recesses of the moulds, and to enable the heat to act more perfectly on the moulded masses in the process of burning.

JOHN ANDREWS, of Fair Oak-terrace, Newport, Monmouth, contractor. *For certain improvements in coke ovens, and in the apparatus connected therewith.* Patent dated July 6, 1852.

Mr. Andrews' improvements consist principally in the mode of arranging the flues to his ovens, which are built in sets of six, so as to effect the more perfect conversion of the coal, and in applying air in a heated or cold state at the crown of the ovens, in order to support combustion. The ovens may be "drawn" either by forcing the coke out from the back, or by a draw-rod worked from the front. In order to protect the draw-rod from the action of the heat, it is covered with ashes, or other non-conducting material, introduced in a trough which is placed alongside the rod, and then inserted over it, in which position it serves as a support over which the coal to be coked is arched; the trough is then withdrawn, and the oven fired.

WARREN STORMES HALE, of Queen-street, Cheapside, candle-maker, and GEORGE ROBERTS, of Great Peter-street, Westminster, miner. *For improvements in the manufacture of night-lights or mortars.* Patent dated July 8, 1852.

The improvements which constitute the subject of the present patent consist in using transparent or semi-transparent materials, by preference gut or animal membrane, for making the cases of night-lights and mortars. The gut is placed in a frame or mould of perforated metal, and the melted fatty matters are poured into it and allowed to cool, after which the gut is cut into lengths and wicked in the usual manner; or the night-lights may be first moulded in lengths, and then wrapped round with animal membrane and cut to the proper size and wicked. In both cases a disc of the same material as that which forms the cases may be used to cover the bottoms of them if desired.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For improvements in machinery for cutting soap into slabs, bars, or cakes.* (A communication.) Patent dated July 10, 1852.

In this improved machinery the cutting of the soap is performed by means of wires or cords stretched in a frame, and kept at a proper state of tension by weights or springs, the soap being placed on a table which is fed up against the wires, and has a series of slots formed in its surface to enable it to traverse past them, so that the soap may be cut from end to end.

JOSEPH BARON PALM, of Castle-street, Holborn. *For an improved mode of baking bricks, tiles, and other kinds of pottery or earthenware.* Patent dated July 13, 1852.

The novelty of this mode of baking consists in constructing the kilns used in two stages or floors, each divided into several chambers, the heat being applied direct to the lower chambers and then passing to the upper ones, and being regulated and directed by suitable dampers.

Claim.—The mode of constructing or combining parts into a kiln.

THOMAS RICHARDS, of St. Erth, and SAMUEL GROSE, of Gwinear, both in Cornwall. *For certain improvements in machinery for reducing and pulverizing ores, minerals, stones, and other substances.* Patent dated July 15, 1852.

A description of this machinery will be found as the first article of our present Number.

Specification Due, but not Enrolled.

THOMAS JORDAN, of Old Broad-street, London. *For improvements in disinfecting essential oils, and in treatng fatty matters obtained from shale, schistus, or other bituminous substances, and in retorts employed in distilling such minerals.* Patent dated July 12, 1852.

PROVISIONAL PROTECTIONS.

Dated December 31, 1852.

1207. Thomas Harrison. Improvements in steam engines.

1209. Thomas Benjamin Smith. Improvements in calcining certain ores, and in the construction of furnaces for that purpose, and for converting certain products arising in the process into an article of commerce not heretofore produced therefrom.

1211. James Lord. Improvements in carriage-steps.

Dated January 1, 1853.

1. William Wilkinson. Improvements in taps and other apparatus for filtering and drawing off liquids.

3. John Addison and Henry S. Eicke. Making a tessellated pavement.

4. Junius St. John Eicke. Deodorizing and preparing American and other resins for mixing with grease, tallows, and wax, so as to improve them by giving them a greater hardness and consistency, and rendering them less liable to be affected by change of temperature.

5. Joseph John William Watson and William Prosser. An improved method of manufacturing steel and of carburizing iron.

6. Thomas Billyeald. An improvement in the apparatus and arrangement of apparatus for making looped fabrics.

7. Joseph Brough. A new manufacture of a vitrefied substance, and its application, alone or in combination with mineral, earthy, and plastic substances, to various useful purposes in the arts, and for certain other new applications of known plastic substances.

9. Matthew Tomlinson. Certain improvements in the manufacture of "species jars" or show jars.

Dated January 3, 1853.

10. David Hulett. Improvements in the manufacture of ornaments for lamps, chandeliers, and architectural purposes.

11. John Bleackley, junior. Improvements in machinery to be used in washing, bleaching, dyeing, and sizing yarns and fabrics.

13. Lazare François Vaudelin. Improvements in apparatus for retarding and stopping railway carriages.

14. Charles Edwards Amos. Certain improvements in the construction of centrifugal pumps.

Dated January 4, 1853.

15. Peter Armand Lecomte de Fontainemoreau. Improvements in axle boxes. A communication.

16. Edward Clarence Shepard. Improvements in the manufacture of gas.

17. Joseph James Welch and John Stewart Margetson. Certain improvements in the manufacture of travelling-cases, wrappers, and certain articles of dress hitherto manufactured of leather.

19. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

Dated January 5, 1853.

20. William Edward Newton. Improvements in atmospheric engines. A communication.

21. Jean Baptiste Pascal. Improvements in obtaining motive power.

22. Gustave Eugene Michel Gerard. Improvements in manufacturing and treating caoutchouc.

23. Gustave Paul de l'Huynes. Improvements in medical portative electro-galvanic apparatus.

24. Thomas Shilton. Certain improvements in weighing-machines.

25. Charles Frederick Whitworth. Improvements in apparatus to be used in connection with railway signals for the purpose of indicating the approach of trains and of preventing collisions.

26. Francis Edwards. Improvements in the method of lettering, figuring, and ornamenting the surface of enamel used for dials and other purposes.

27. Frederick Arnold. Improvements in heating the water in a bath or other vessel.

28. Herbert Newton Penrice. Improvements in propelling vessels.

29. William Bendwell. Improvements in treating sewage waters and matters.

Dated January 6, 1853.

30. Emile Grillet. Improvements in renewing the teeth of files.

32. Edward Hutchinson. Certain improvements in the mode or method of preparing, cleaning, drying, and otherwise treating wheat, pulse seeds, and other grain.

34. Robert Watson Savage. An alarum bedstead.

36. Robert Whinerey. Certain improvements in or upon the manufacture and treatment of leather, either alone or in combination with other materials.

38. William Edward Newton. Improvements in roving, spinning, or twisting cotton or other fibrous substances, which invention he denominates "Larwill's improvements." A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January* 18*th*, 1853.)

109. William Austin and William Sutherland. Improvements in ornamenting glass.

219. Arthur Richard Burr. Certain improvements in making gun and pistol barrels applicable to the manufacture of other kinds of tubes.

253. Charles de Bergue. Certain improvements in machinery for punching metals and for riveting together metallic plates or bars.

302. William Townley. Improved machinery or apparatus for watering and flushing streets, squares, courts, and other localities.

447. George Gadd. Improvements in apparatus for roasting coffee.

454. Charles Clarke and John Gilbert. Improve-

ments in the supply and distribution of water and other fluids.

472 Joseph Rose. Improvements in locks.

516. Arthur Wall. Improvements in the manufacture of sulphuric and other acids.

724. Charles Seaton. Improvements in the manufacture of metal tubes, and in the machinery employed therein.

914. James Mayelston Haldon. Certain improvements in the means of rendering wood imperishable and uninflammable. A communication.

917. John Brannis Birch and Eugenius Birch. Improvements in forming drains, and introducing pipes or tubes into the earth.

960. Joseph Bentley. Improvements applicable to fire-arms.

965. Denis John Murphy. An improved agricultural-machine, which he calls the "Archimedean Agricultural-machine."

1094. Alfred Krupp Improvements in cannons.

1110. George Lingard. Improvements in taps, and apparatus connected therewith, for admitting air to beer and other liquors under draught.

1111. William Wilkinson. Improvements in the manufacture of paper and pasteboard, and in the production of a substance applicable for veneers, panels, and to many purposes to which gutta percha and papier maché are applicable.

1121. George Beadon. Improvements in constructing and propelling ships and vessels.

1128. Ephraim Mosely. Improvements in the manufacture of artificial masticating apparatus.

1140. John Moore Hyde. Improvements in steam-engines and the production of steam for the same,

1153. John Hinks. A new or improved pen-holder.

1155. Joseph Burch. Certain improvements in machinery, for reaping, loading, stacking, and storing grain, and other agricultural produce.

1156. Joseph Burch. Certain improvements in machinery applicable to thrashing, winnowing, cleaning, and sorting grain, and to other agricultural purposes.

1160. George Michiels. Improvements in the manufacture of gas.

1163. Alfred Vincent Newton. Improvements in obtaining and applying motive power. A communication.

1168. George Ingham. Certain improvements in machinery for drawing cotton and other fibrous materials.

1169. John Frederick Gordon. Facilitating the turning of four-wheeled carriages, and bringing the front and hind wheels nearer to each other, entitled "The Caster Axle."

1180. William Busfield. Improvements in apparatus for combing wool, and other fibrous substances requiring like process.

1186. John Copling, jun. A safeguard railway signal.

1188. John Whichcord the younger, and Samuel Egan Rosser. Certain improvements in the mode of burning and applying gas for light and heat.

1196. James Power. Silvering all sorts of metals, and of glass.

1201. Henry Hutchinson. Improvements in machines for washing bottles.

1203. Robert Stephen Oliver. Certain improvements in waterproof and other garments.

1106. Robert Taylerson. Improvements in ship-building.

1211. James Lord. Improvements in carriage-steps.

1. William Wilkinson. Improvements in taps and other apparatus for filtering and drawing off liquids.

5. Joseph John William Watson and William Prosser. An improved method of manufacturing steel and of carburizing iron.

14. Charles Edwards Amos. Certain improvements in the construction of centrifugal pumps.

19. George Gwynne and George Fergusson Wilson. Improvements in treating fatty and oily matters.

27. Frederick Arnold. Improvements in heating the water in a bath or other vessel.

28. Herbert Newton Penrioe. Improvements in propelling vessels.

38. William Edward Newton. Improvements in roving, spinning, or twisting cotton or other fibrous substances, which invention he denominates "Larwill's Improvements." A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS UNDER THE NEW LAW.

Sealed Jan. 8, 1853.

1. Robert Adams.
2. George Henry Brockbank.
4. James Hodgson.
6. Moses Poole.
9. George Green.
13. Edward Lambert Hayward.
14. Thomas Christy, jun.
16. Moses Poole.
19. Moses Poole.
21. George Duncan and Arthur Hutton.
24. Moses Poole.
28. Moses Poole.
29. John Daniel Ebingre.
30. Moses Poole.
32. William Pym Flynn.
33. Moses Poole.
37. Moses Poole.
43. Moses Poole.
120. George Collier.
121. John Lee Stevens.
123. Richard Whytock.
136. William George Nixey.
162. John Ignatius Fuchs.
163. Moses Poole.
230. James Bullough, David Whittaker, and John Walmesley.
246. George Hallen Cottam.
273. John Frederick Chatwin.
274. John Frederick Chatwin.
315. Alexander Clark and Patrick Clark.
624. Edward Lord.
659. John, Edward, and Charles Gosnell.
674. Peter Fairbairn.
776. Francis Bresson.

Sealed Jan. 14, 1853.

3. Peter Spence.
212. Thomas Slater and Joseph John William Watson.

265. David Collison.
579. Alfred Vincent Newton.
595. Joseph John William Watson and Thomas Slater.
666. Benjamin Baillie.
685. Robert Knowles.
695. Robert Buncombe Evans.
741. Samuel Sedgwick.
747. Robert Reyburn.
774. John Hinchcliff and Ralph Salt.
808. George Wilson.
827. John Kilner.

Sealed Jan. 17, 1853.

11. Thomas Wood Gray
129. Joseph Cox.
146. Edwin Lewis Brundage.
204. Bendix Ising Jacoby.
275. Alphonse René Le Mire de Normandy.
358. William H. Smith.
533. Anthony Fothergill Bainbridge.
534. Samuel Clarke.
564. William Bates.
574. John Gedge.
588. George Fergusson Wilson and Edward Partridge.
592. George Dixon.
600. George Fergusson Wilson.
602. John Chubb.
620. George Fergusson Wilson.
635. Charles Pryse and Richard Redman.
655. Robert Booty Cousens.
656. Admiral Earl Dundonald.
664. John Arthur Phillips.
665. Thomas Hicks Chandler.
667. William Frederick de la Rue and George Waterston.
694. Charles Griffin.
697. Obed Hussey.
710. James Noble.
711. Colin Mather and William Wilkinson Platt.
738. Richard Coad.
740. Admiral Earl Dundonald.
760. John Dent Goodman.
761. Samuel Holt.
771. John Thomas Way and Thomas Manwaring Paine.
772. Isaac Lowthian Bell.
785. Peter Carmichael.
786. John Burgess.
790. Benjamin Nickels.
802. Jonn Brettell Collins.
818. William Hedges.
833. John Frearson.
862. Andrew Jeffrey.

Sealed Jan. 19, 1853.

211. Thomas Scott.
308. John Lewthwaite.
452. John Carnaby.
627. Alfred Augustus de Reginald Hely.
713. John Henry Johnson.
824. John Winter.
825. John Winter.
865. Charles Harford.
871. James Taylor.
880. Alexander Turiff.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Jan. 7	3408	Janet Thos. Hewes	Southampton	Ventilating waterproof garments.
11	3409	Caleb Hill	Cheddar	Stay and dress fastening.
12	3410	Wm. Edward Kilburn	Regent-street	Stereoscopic or binocular case.
13	3411	Neild and Collander	Little Friday-street	Manifold vest.
14	3412	John Paterson	Wood-street	Summer collar tie.
17	3413	T. and J. Driver	Minories	Bearing and hooks for scale-beams.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Jan. 13	489	Richard Nicholas	Birmingham	Spindle shot-charger.
20	490	William Bird	Oxford-street	Upper-leather for boots, &c.

TO CORRESPONDENTS.

An Amateur wishes to know how a transparent ornamentation upon an opaque ground is given to glass. This is effected in general by etching with fluoric acid when large surfaces are to be operated upon; for smaller surfaces, mechanical methods are resorted to, and these are in most instances preferred in the workshop to chemical processes. When etching by fluoric acid is the method adopted, this circumstance is to be observed, that the action of the acid itself upon glass etches it in transparent lines, whereas a surface of glass exposed to the fluoric vapour receives at once a dull or opaque appearance. To prepare the glass for operation by fluoric acid, a thin film of some resinous substance must be laid upon it for a "resistent," and portions of this must be removed by stencilling, or otherwise, according to the pattern intended. When the glass has been thus treated, it is convenient to enclose it in a leaden receptacle, filled with the vapour or the acid; as

their action upon lead is extremely feeble. A regular pattern may sometimes be produced in a very elegant manner by means of net. A piece of net is plunged into a vessel containing mucilaginous matter, which is afterwards carefully expelled from the interstices by a manipulation which allows currents of air to pass through them, and in that state is laid upon the surface to be etched. When dry, a resinous solution is to be lightly brushed over it, which will find its way to the glass under the interstices, but will be excluded elsewhere by the contact between the net and the glass. The solution having become dry, and the net being removed from the glass, it is obvious that the etching process will reproduce upon the glass the exact pattern of the net. If the reverse process be required, that is, if the interstices are to be etched, the mucilage will be dispensed with, and the resinous solution alone employed. The net will be laid upon the glass, and immediately removed, leaving behind a resisting pattern of itself.

There are several modes of ornamenting glass and earthenware in the arts, one of which is similar to that employed for painting or staining it. The object to be coloured or stained is first covered over with a thin layer of adhesive matter, for which purpose the essence of lavender is considered good. Upon this coating the colouring oxides, mixed with the requisite fluxes, all in a state of minute subdivision, are gently deposited, and in that state the colours are fixed by firing.

In connection with glass and its decorations, it is important to observe that the extensive firm of Hartley and Co., of Sunderland, have commenced a monthly publication on the subject, the first Number of which has just made its appearance. A well executed engraving of the interior of the works at Sunderland is given in it, and the text is occupied with information regarding every known kind of glass. The idea is an excellent one, and if the progress of other manufactures were similarly represented, as we are inclined to think they will be with this great example to follow, it would produce most important and most marked results.

F. S., Highfield, Sheffield, asks for information on the subject of the extraction of silver from lead ore. Some recent patents are directed particularly to this object, and describe processes of easy application and great efficiency. That of Mr. Alexander Parkes, of Birmingham, obtained in June, 1851, for improvements in separating silver from other metals, is one of these. In a patent, obtained twelve months before, that gentleman described a means of extracting silver from lead ore, by first melting the lead, and then using zinc, in a melted state, to combine with the silver held in suspension by the lead. The improvement which he introduced into that process, by his patent of 1851, consisted in properly proportionating the quantity of zinc employed. For ore containing 14 ozs. of silver to the ton, one part of zinc to every hundred of ore is recommended as a good proportion. The lead having been smelted, and its temperature raised to the melting point of zinc, the zinc is introduced, and, after having been well mixed, time is allowed for it to rise to the surface with the silver. When the metal begins to set, the zinc is skimmed off and put aside for a subsequent process of separation. The alloy of zinc and silver is now to be concentrated, which is done by putting it in an iron pot with a perforated bottom, and applying a low heat, in order to melt out any portion of the lead which might remain. The alloy thus concentrated is then to be submitted to a low heat again, in order to oxidize the zinc, and to admit of its being dissolved by sulphuric or muriatic acid, leaving the silver to be treated in the ordinary manner. A process by distillation is also described, and also a subsidiary one of freeing the desilverised lead from the small proportion of zinc it will still contain. These processes are described at p. 18 of the Fifty-sixth Volume of the *Mechanics' Magazine*. Mr. Parkes also obtained a patent in September, 1851, where he describes a general method of treating argentiferous ores. This will be found at p. 238 of the same volume. In a patent obtained by the same gentleman on the 1st of May 1852, and which will be found at p. 414 of last volume, another process is described, which consists in employing a metal or compound fusible at a lower temperature than the compound to be operated upon. The patent of Mr. Gurlt, of Manchester, dated October 10th, 1850, and described at p. 316, vol. liv., also bears upon this subject. In this patent the existing methods are referred to, the "eliquation" process, the European amalgamation process, the American amalgamation process, and two other methods. The patentee's method is different from all of these, and consists generally in converting the sulphuret of silver contained in the ore into chloride of silver, which will be dissolved in its nascent state, and can be obtained in its metallic form by the usual process of precipitation.

H. H., Mark-lane.—In vol. lv., p. 41, of the *Mechanics' Magazine*, is a full description, with engravings, of Ericsson's Caloric-engine, as patented in this country in its most improved form. H. H. will find in vol. lvi. a full explanation of the principle of the engine, illustrated by engravings which exhibit its application.

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VON SPARRE'S ORE-SEPARATING MACHINERY.

Fig. 3. Fig. 1.

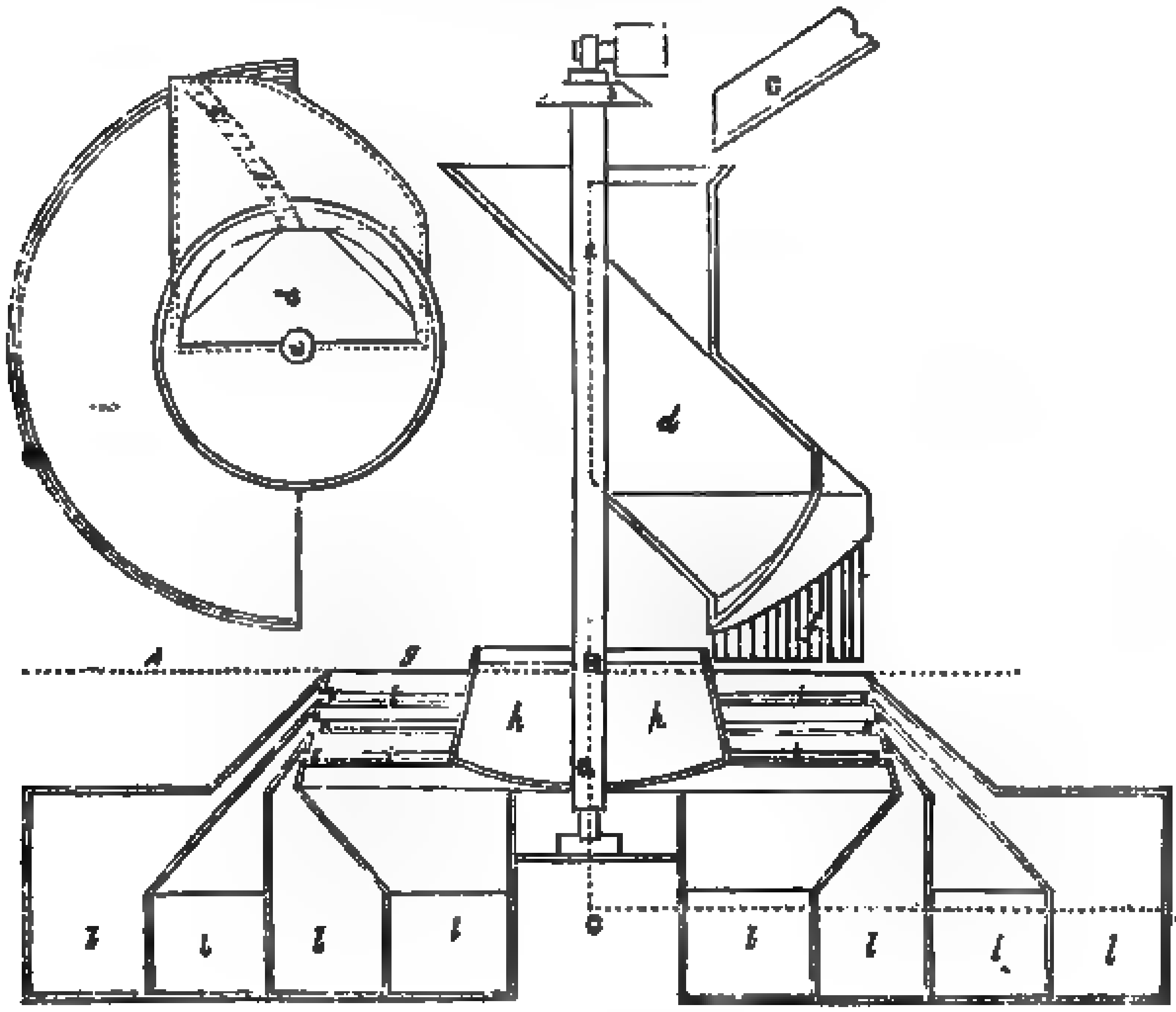
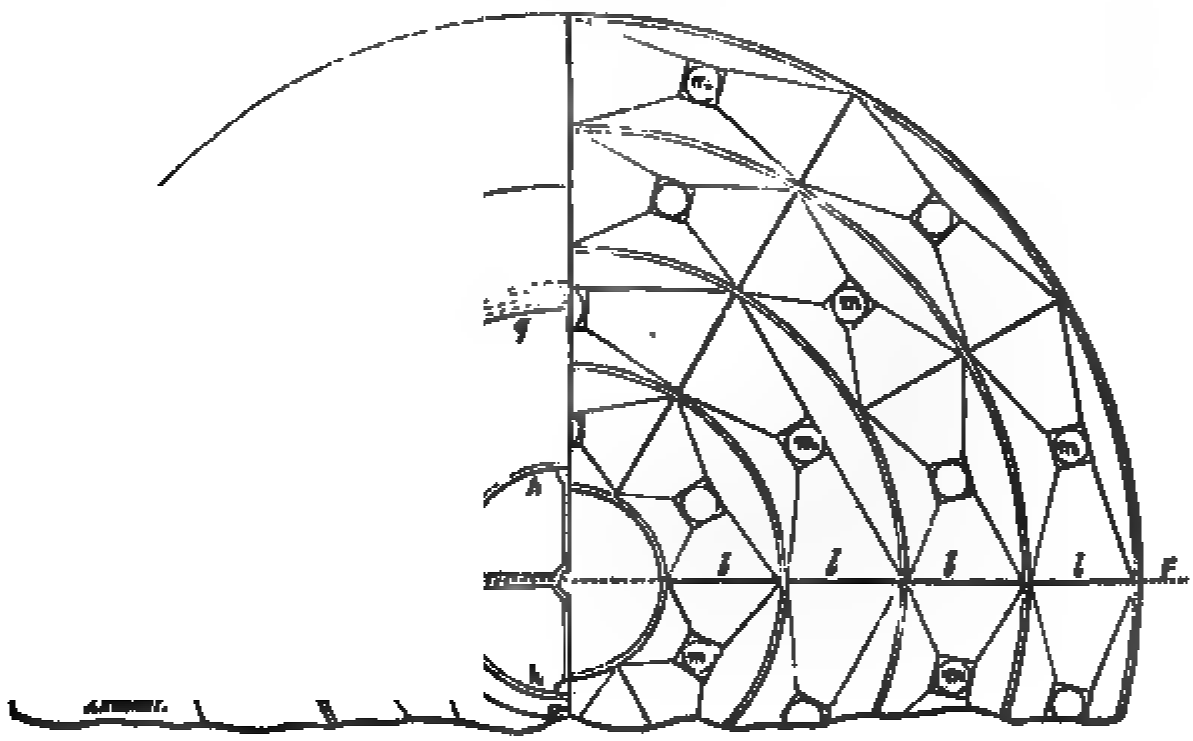


Fig. 2.



VON SPARRE'S ORE-SEPARATING MACHINERY.

(Patent dated July 20, 1852. Specification enrolled January 20, 1853.)

M. Von Sparre's invention for separating substances of different specific gravities is based upon the well-known principle that when substances of equal volume or size, but of different specific gravities, fall into a resisting fluid, such for instance as water, they sink with different velocities; the velocity of the heavier ones being greater than that of the lighter, and this in proportion to their difference of specific gravity. The manner in which this principle is applied by the inventor is exhibited in the accompanying figures.

Fig. 1 is a vertical section of one of the arrangements on the line EF of fig. 2. Fig. 2 is a horizontal section on the line ABCD of fig. I; and fig. 3 is an underside view of the main-shaft and its appurtenances. *a* is a vertical shaft or axle, which has rotary motion communicated to it from any suitable prime-mover by means of the bevel gearing *b*. *c* is a shoot or gutter leading from an ore-receiver, by means of which the substances to be operated upon are supplied to the machine. These substances, whether ores, gold sand, or coal, are to be previously assorted, according to their size, by any of the methods ordinarily in use for this purpose. *d* is a cylindrical casing for containing the substances to be separated, which casing is fixed to the upper part of the revolving shaft *a*. *e* is an aperture in the bottom of the casing *d*, through which the substances pass to the water-vessel. *f* is an inclined curvilinear way, down which the substances roll after passing through the aperture *e*. The object of this curvilinear way is to impart to the substances traversing it a horizontal motion, in a direction opposite to that in which the machine is moving, and sufficiently powerful to counteract their centrifugal tendency, and thus cause them to fall into the water vertically. *g* is a cylindrical vessel filled with water, into which the substances to be separated fall. *h* is a cylinder composed of metal or other suitable material, which is attached to the lower part of the shaft or axle *a*, and turns with that shaft in the water-vessel *g*. *i i* are horizontal partitions or ledges placed at certain given distances apart around the periphery of the cylinder *h*. The ledges, or partitions, do not surround the entire periphery of the cylinder, but only from one-half to two-thirds of it, so that a portion of the annular space between the exterior of the cylinder *h*, and the sides of the water-vessel *g*, in which that cylinder revolves, is left open to allow the substances to be separated to sink freely in the water in the vessel *g*. *k k* are openings in the sides of the water-vessel *g*, through which the separated substances are ejected by centrifugal force into the receivers *l l*, which are in communication with the vessel *g*, and arranged around it at convenient distances. *mm* are openings in the tops of the receivers *l l*, through which the separated substances are removed from time to time as they accumulate, but which are closed by valves during the time the machine is at work.

The operation of the machine is as follows:—The substances to be separated having been previously assorted according to their size, as before mentioned, are supplied to the casing *d*, the machine being in rotation, from any convenient receptacle by the shoot *c*. From the casing *d*, they pass through the aperture *e*, down the curvilinear inclined way *f*, the peculiar form of which, passing gradually from a vertical to a horizontal direction, imparts to them a horizontal velocity in a direction contrary to that in which the machine is revolving, the effect of which is to overcome the centrifugal tendency they may have acquired on entering the curvilinear way, and to cause them to drop from it perpendicularly into the water contained in the annular space of the vessel *g*. The curve of this way, or its height above the vessel *g*, and distance from the centre of motion at each particular point, must be determined by the ratio of centrifugal

force exerted at such points; and, consequently, the curvature must be greatest near the sides of the cylindrical vessel *g*, and gradually diminish as it approaches the cylinder *h*. On leaving the curvilinear way, the substances fall into the water in a line across the annular space between the cylinder *h* and the casing *g*, and at the part which is left open between the ends of the segmental partitions or ledges *i i*, but close to the receding ends of the ledges, and immediately sink to the bottom with a velocity corresponding to their specific gravity.

As the substances are continuously introduced into the vessel *g* at this point only, a certain time must always elapse before the advancing ends of the partitions on the revolving cylinder come up to it; and as the heavier substances sink more quickly than those which are lighter, they will have deposited themselves on the bottom of the vessel *g*, whilst the lighter portions will be still held in suspension, when the advancing ends of the partitions or ledges come up to the point at which they were introduced. The partitions will then, by the continuous rotation of the machine, pass between and intercept the falling substances, which will be divided into as many different parcels, each of about the same specific gravity, as there are ledges or partitions to the cylinder. The substances thus separated and deposited on the ledges will, at the moment of touching them, be thrown by the centrifugal force communicated to them by friction through the openings *k k* in the sides of the vessel *g g* into the receivers *l l*, and the process of separation will continue unintermittingly so long as the rotation of the machine is kept up, and the substances supplied to be operated on.

Thus a continuous process of supplying the materials to be separated from each other, and of separating and ejecting them from the water vessel into the receivers, is constantly going on at all points of the annular space of the water vessel. As the horizontal ledges or partitions occupy from one-half to two-thirds of the annular space in the water vessel *g*, a rotary motion must, of necessity, be communicated by them to the water in that vessel through which they pass in their revolution. This motion will not, in any case, be sufficient to affect the efficient working of the apparatus, but, on the contrary, it will admit of the speed of the main shaft being increased, and thus enable a greater amount of work to be performed in a given time.

MARSTON'S PATENT BREECH-LOADING AND SELF-CLEANING RIFLE.

During the past week much attention has been directed to the construction and operation of Marston's patent breech and cartridges, contrivances remarkable for their simplicity, and the efficiency with which they jointly answer the objects required in fire-arms of the best construction. Of all guns on the breech-loading principle, this certainly seems to be the most calculated to give full effect to the philosophical superiority of that arrangement; as it admits of rapidity of charging and discharging, and, at the same time, presents the inestimable advantage of leaving the bore of the piece bright and smooth after any number of discharges. This important invention is due to Mr. William Marston, of New York,—a gunsmith and mechanician of great skill and originality. Associated with him is Mr. John Trainor Moulton, an American gentleman, who, perceiving the great value of the contrivance, secured a patent for the gun in January, 1851, and for the cartridges in May, 1852, and has since brought them into favourable notice with the governments of America, France, and England. The rapidity of their introduction into the services of the three Powers just mentioned, notwithstanding the rivalry of other inventions of acknowledged merit, is only to be accounted for by their simplicity in point of construction, and the numerous practical advantages incidental to their use.

The patent breech amounts in effect to the shortening of the entire length of the barrel by the length of one cartridge, and then supplying a solid re-acting surface for the explosion, which no intensity of the explosive force is capable of shaking. A glance at the means supplied by the invention for effecting this object will show how quickly it may be accomplished. A loading-lever G, of the first-class, turning upon a fulcrum F, placed a little behind the trigger, and bent outside, so as to form a convenient trigger-guard, as shown in Fig. 1, terminates at the working end E, within the stock of the piece, as shown in Fig. 2, in a cam-groove. Abutting upon this is the

breech-bolt B, which represents both breech and ramrod. A pin C, fixed at the back end of the breech-bolt, enters this groove, and enables the loading-lever to draw the bolt back, or to push it forward into the barrel, with an easy and rapid motion.

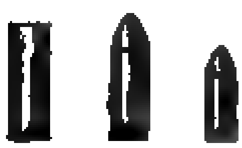
This is nearly all of that portion of the invention which relates to the breech. We must now pass on to notice the structure of the cartridges. The exterior of these missiles is represented in figures 3, 4, and 5. They consist of a pasteboard cylindrical case, or shell, slightly less in diameter than that of the barrel. In the chamber thus formed the charge is deposited, and it is closed in front by the bullet of the usual conoidal form, which is cemented into it, and at the other end by a circular leathern disc, or wad, pierced through the centre. The operation of loading is thus performed. The loading-lever is opened, or pushed outwards from the stock, which draws back the breech-bolt from the butt of the gun, and leaves an open place in the barrel for the reception of the cartridge. This being put in, and the loading-lever closed, the cartridge will obviously be thrust forward into the barrel. The end of the breech-bolt next the cartridge is a cylinder accurately fitting the bore, thus confining the explosion, and a perforation proceeds from the centre of its terminal face, through the mass of the bolt, to its upper surface. When the loading-lever has completed its stroke, the upper extremity of the perforation coincides accurately with that in the nipple, thus forming a continuous canal for the priming-fire, from the nipple to the charge, through the perforation in the leathern wad. In this state the gun will be discharged by a pull of the trigger.

The cleaning action takes place in this way. By the explosion, the shot and casing are discharged, but the leather wad, against which its action is directed, remains by the breech-bolt. At the next charge this wad

Fig. 1.

Fig. 2.

Fig. 3. Fig. 4. Fig. 5.



is driven in before the cartridge, and as it is a trifle larger than the section of the bore, and its edge is well greased, its rapid motion through the barrel in forcible contact with its interior, when the piece is fired, removes the deposit from the previous discharge.

One word, in passing, about the lock, the simplicity of which is worthy of notice. It differs from the common lock, inasmuch as the springs, &c., are contained in it as in a box, the two sides of the lock being raised flanges. The common lock is let into the stock; this has but to be screwed to the stock, which differs from any other. This principle of construction affords the means of strengthening the small three-legged brace-plate screwed over the tumbler which acts upon the hammer.

With Marston's rifle, results have been

achieved which have excited the greatest surprise and admiration. Two desirable and important objects are simultaneously attained, besides some collateral ones of minor utility. Loading at the breech is effected with a rapidity and ease which has not hitherto been had in fire-arms, not even in Colt's revolvers, and pieces of analogous form; and at every discharge the barrel is cleaned out in the act of firing. One of the pieces on Marston's construction, which was exhibited to us after having been discharged some thousands of times, presented a perfectly brilliant appearance, where a view could be obtained of the surface of the bore.

It may be stated further, that it has been found to yield a much deeper penetration than is the case with other guns under ordinary circumstances. At Woolwich, in the presence of Lord Hardinge and numerous officers of both arms of the service, it drove a shot through 8 inches of a mass of pine, penetrating the 9th inch, at a range of 200 yards. At a range of 600 yards, with a charge of only 40 grains of gunpowder—charges in this country being generally 85, and sometimes 90 grains—it is easy to hit an extremely small object. Its rapidity of manipulation is such, that it can be loaded and discharged 12 times whilst a Colt's revolver, or other similar piece, has its six chambers loaded and fired. Another great practical advantage resulting from this arrangement is, that there is no recoil. The reaction of the powder against the bolt is conveyed to the working end of the lever in contact with it, after undergoing a reduction of about one-half on account of change of direction, and is ultimately sustained by the strong pin about which the lever turns. Here, in point of statical effect, we have the case of the arch reproduced; the breech-bolt representing the crown of the arch, and the working end of the lever the flanks, the pressure upon the crown being ultimately distributed through the mass to the lever, as an abutment. No "kicking" of the piece, therefore, can occur. So certain, too, is its working, that it never yet has been known to miss fire, and Mr. Moulton is quite willing to give a sovereign for every "miss fire," provided he is paid one penny for every effective one.

The leather wads are punched out, perforated, pressed, and greased in one machine, and women and children are employed in the great factory at New York in making the cartridges. So expeditiously are they put together, that an entire army could be provided with ammunition in 30 hours. As the wads are pierced and pressed, the small filaments of leather which remain about the hole prevent the powder from escaping.

The *Scientific American* of the 8th instant thus alludes to the manufacture of these weapons:—"Rifles, pistols, and shot-guns are now manufactured on a large scale, under the eye of the inventor, a practical gunsmith, in the factory at the corner of Washington and Jane-streets, in this city (New York). No less than 90 hands are employed continually, and rifles from 25 to 100 dollars are constructed. This rifle will no doubt arrest the attention of Mr. J. Chapman, author of 'The American Rifle.' The question of good fire-arms has been an exciting one for some time, and at the present moment this rifle of Mr. Marston is creating quite a stir in the capital of France, where Mr. Moulton has been astonishing the Parisians with its excellent qualities in rapidity of loading, length of reach, and accuracy of aim. We have no doubt but that the breech-loading fire-arm will yet supplant the muzzle-loading kind entirely. Why should the ball be rammed down from the top of the barrel to the bottom, to be driven back the old road again? It is not reasonable; no scientific argument can be adduced in its favour, but plenty against it."

Mr. Moulton has been for some time past in France, where Mr. Marston's invention has, under his auspices, been put to the severest tests, in comparison with the Minié and other pieces. It has received the full sanction of that government. Mr. Moulton has been honoured with very extensive orders from the French government, and the Emperor has directed him to undertake the construction of cartridges with a conoidal ball of his own device, having a sharper figure than is usually adopted. At Woolwich it has also received the approbation of the Ordnance authorities, and of the Commander-in-Chief. The only question between Mr. Moulton and our Government is, as to whether the guns are to be made at New York or in this country—Mr. Moulton insisting on the former alternative. Mr. Moulton states that this invention is capable of saving France 300,000 dollars per annum, and this country 150,000. In the meanwhile Mr. Moulton has some very large orders on hand for Australia, and as it is impossible to undertake them at New York, he contemplates founding an establishment for their manufacture in this country, on a very extensive scale. Judging from the evident capabilities of this new weapon, it cannot fail of rapidly coming into very general use in the military services on both sides of the Atlantic.

Mr. Goodell is co-patentee with Mr. Marston for the cartridges.

THE CALORIC SHIP "ERICSSON."

In our last Number we mentioned the fact of the successful performance of this vessel on her trial trip. We now give a detailed account of the trial, as stated in the *New York Herald:*

The ship *Ericsson* made her trial trip on Tuesday morning, down the bay of New York; and from the complete triumph with which the experiment was attended, there need now be no hesitation in acknowledging caloric as a great natural element adapted to locomotion, destined to work a complete revolution in navigation, and to confer an inestimable benefit on mankind.

The *Ericsson* was put under caloric early on Tuesday morning, and started from Williamsburg between 9 and 10 o'clock. At 9 h. 56 m., she passed the flagstaff on Governor's Island, and at 10 h. 30 m. and 30 seconds, she was abreast Fort Diamond,—thus making a distance of 7¾ miles in 34 minutes 30 seconds. From thence she proceeded down the bay, rounded to below Spit-head buoy at 11 h. 21 m., and there anchored in consequence of a snow squall. She returned on Wednesday, and anchored off the Battery at about 2 o'clock in the afternoon. The distance between the stated points on Governor's Island and Fort Diamond being accurately known by triangulation to be 7 miles, 660 yards, the speed attained was, as stated, about 14 miles an hour. The consumption of fuel is ascertained to be only 6 English tons per 24 hours,—a saving, as compared with steam ships of more than 80 per cent. As the ship draws 16 feet 10 inches on an even keel, this performance, at a first trial, has astonished all concerned in the enterprise.

The vessel measures 260 feet in length of deck, and 40 feet in breadth of beam; her depth of hold is 27 feet, and her burthen 2,200 tons. Like the *Arabia*, of the Cunard line, she has but two masts; and like our swiftest clippers, she is extremely sharp in the prow. She has no figure-head. Her stern presents the device of two figures—allegorical representations of the United States and Great Britain—placing a wreath around the brow of the inventor.

[The following summary of the peculiarities of the construction of the vessel, and of her engines will be read with in terest.]

As a model of naval architecture, there is not a vessel in our splendid merchant marine that can compete with the *Ericsson* for graceful proportions and symmetry of build. All who have seen her concur in the expression of admiration of this beautiful ship, and in their opinion of her superior sailing qualities, independent of any aid from her machinery.

Apart from the main principle, the distinguishing feature of the engines of the *Ericsson* consists in dispensing with the centre shaft, whilst at the same time two pairs of working cylinders are employed, imparting a continuous rotary movement, as in the double marine steam engine. The arrangement by which Captain Ericsson attains this desirable uniform action presents one of the most elegant mechanical combinations ever produced. Each pair of working cylinders, with their appropriate supply cylinders, are placed parallel to the ship's centre line—one pair forward of, and the other abaft the paddle shaft. The supply cylinders being inverted and placed at some distance above the working cylinders, with their open ends presented to the open ends of the working cylinders, a space is formed between the two, which contains a triangular lever for transmitting the vertical energy of the working pistons to the crank of the paddle shaft by a diagonal movement. The mean angle of their diagonal being about 45 degrees abaft the vertical plane of the paddle shaft, in the aft engine, and 45 degrees forward of that plane in the forward engine, it is obvious that the forces of the two engines will be exerted nearly at right angles to each other. Hence the double cranks, and the objectionable centre shaft of the marine steam engine are obviated, a single crank placed in the middle of the caloric ship serving to transmit, in a perfect manner, the continuous rotary motion required in turning paddle-wheels for ocean purposes. In further comparing the machinery of the *Ericsson* with the double marine steam engine, it will be found that the four side levers have disappeared; the cross heads and cross tails likewise,—nor are the four side rods to be found; and, above all, the absence of the parallel motions, with their nicely-adjusted joints, and levers for converting the curved movements into straight ones, claims attention. In place of all these parts will be found simply a triangular lever for each engine, with a link and connecting-rod for transmitting the power of the pistons to the crank of the paddle shaft. Again, the four huge boilers of the ocean steamer give place to four small furnaces, erected under the working cylinders. Force-pumps, brine-pump, safety-valves, &c., and the network of connecting-pipes, which fill the bottom of the ocean steamer, have all disappeared; and in place of gauge-cocks, brine-gauges, injection-valves, &c., &c., calling for incessant vigilance on the part of many minds and hands at once, a

single handle attached to the valve-gear of the engines regulates, at the will of a single mind, the movements of a caloric ship. Starting, stopping, backing, and checking being effected by this single handle, without any regard to particular conditions, so essential in working the engines of the steamers. The arrangement of the caloric ship being such that the required air for the engines—from 50 to 70 tons weight per hour—has to pass through the fire-rooms before entering the supply cylinders, it has been found in the *Ericsson* that the temperature is actually too low for the comfort of the firemen.

[We are told by a Correspondent at New York that no engineers are permitted to visit the *Ericsson*, and that none except those connected with her have been on board; that all the statements given to the public are supplied from within, and that there is no means of verifying them. From our past experience of the delusive expressions of the success of great undertakings in which our American contemporaries are apt to indulge prematurely, and frequently without the slightest justification, we think it our duty to notice this communication. Far from yielding, however, to the doubts which it suggests, we trust, for the sake of the promotion of science, in which we are equally interested with our transatlantic brethren, that the specified measure of triumph has been fully realized, and we shall be the first to hail the arrival of the *Ericsson* upon our coast as a new and glorious feature in the annals of human invention, quite irrespectively of the country to which it is due.—Ed. M. M.]

The Synoptical Euclid. By Samuel A. Good, Member of the College of Preceptors, and Master of the Mathematical School in Her Majesty's Dockyard, Pembroke. Charles Law.

The study of Geometry by the young is one which peculiarly demands the efforts of the ingenious in the art of school-book making to render simple and attractive. As soon as it is settled that it should form an element of education, without reference to the subsequent prosecution of the collateral branches of the science of magnitude, but were it only for its vigorous development of the mind, and the resources with which it furnishes it, it should be the aim of those who are engaged in educational or academical pursuits to soften down the asperities of the road which the young beginner has to travel, and to be careful that from the first no demand upon his powers should be made beyond that which he may be reasonably supposed capable of. Disregard of, or inattention to, this circumstance has been the means in innumerable instances of destroying in the bud all inclination for this subject, and the loss to science has been proportionately great. The "Elements of Euclid," or, as that wonderful production is universally known—"Euclid"—displays in its arrangement and simplicity the very perfection of human reason. Starting from a few points which the mind is so constituted as to accept as soon as the terms employed in stating them are comprehended, it proceeds upon a syllogistic arrangement, of which every one who considers it feels the force, the ingenuity, and the beauty, to those advanced topics of pure geometry which bring us to the threshold of the most sublime investigations. It is hardly to be expected, however, that this should be perceived and appreciated by the young, and we have no hesitation in expressing our opinion, that, in the great majority of instances, to present a "Euclid" to a beginner for his first effort in geometry, is a mistaken judgment which is visited by an intense aversion to proceed further. Let the truths here laid down in this book be exhibited mechanically, and proved to the eye in an attractive manner, and the student will then probably be curious to know how they are established by the mere power of logical reasoning. Even with this precautionary course, the editions of "Euclid" in common use are much too abrupt a step to attempt. Though the constructions and demonstrations are not embarrassed by prolixity, still to the young there is an appearance of confusion which the mind participates in by frequently losing sight of the salient points of the argument. The volume before us is arranged upon a simple principle, and one altogether original, admirably adapted to contend against this difficulty. It gives the general enunciation, the particular enunciation, and the construction of each proposition, in the usual manner, but as it reaches in succession the several steps of the proofs, it displays them prominently in italic characters in the middle of the page, leaving spaces between them for the context. The order of points to be proved is thus clearly exhibited, and the eye is enabled to rest upon

them with ease, without having to go over the same ground again. When the proposition has been once studied, it is obviously only necessary to glance over those isolated passages to acquire a complete and well-digested knowledge of the entire demonstration. It is wholly superfluous to say one word in commendation of this principle of arrangement. Pupils and teachers will alike appreciate it, and Mr. Good has conferred an inestimable benefit on the educational section of the community, in thus facilitating the acquisition of that small but all-important part of human knowledge which consists of unalloyed truth.

THE TRADES OF BIRMINGHAM.

THE Soho Foundry was never busier than at the present time, not even in the golden days of Boulton and Watt. Steam engines, principally for marine uses, are in course of construction of from 30 to 700-horse power, and orders continue to pour in upon the establishment almost without intermission. The wages of the founder have recently been advanced without solicitation on the part of the work-people.

In connection with steam engines, it may be mentioned that Messrs. J. and E. Wright, extensive rope-manufacturers of this town, have commenced the erection of steam machinery on a gigantic scale, and of an improved nature, for the manufacture of ropes on a new principle. This is the first application in the midland counties of any other than hand-labour in the manufacture of the above-named article. Some idea of what is being done in Birmingham in the rope trade may be formed from the fact that a short time since Messrs. Wright received an order from the Canary Isles for the enormous quantity of 27 tons of twine.

Of the nine articles which may be classed as metals in the returns of the Board of Trade, there are only two in the export of which there has been a reduction—brass and tin plates. At present the orders for tin plates from Australia and South America will tax the manufacturing capabilities of the trade for several months to come.

There is no abatement in the activity of the gun trade. Every house engaged in the manufacture is fully employed, and a further Government demand is expected.

On Thursday circulars were issued from the large houses, announcing an advance of *5l.* per ton in the price of tin, with the following quotations:—"Tin in blocks, 108s. per cwt.; ingots, 108s. 6d.; bars, 110s.; refined in blocks, 111s.; plate grain, 115s.; fine grain, 126s.; granulated, 130s.; six months' acceptance, or 1 per cent. discount for bill at three months, or 2 per cent. discount for cash in one month." About the same time an advance of upwards of *5l.* was declared on copper, and large orders were refused at that advance, the general impression being that, owing to the alleged scarcity of the article, it would soon reach *144l.* per ton. The metal-dealers will not receive orders for large quantities, unless upon the understanding that they are to be paid for at the rate of price at the time of delivery. In consequence of these advances, very considerable embarrassment has been experienced by the manufacturers, and persons of limited capital are unable to execute orders which would otherwise be profitable. The demands for tin articles for the Australian market and emigration are very extensive, and for months to come will tax the energies of the manufacturers to execute them. Good tin-workers are therefore in requisition, and at remunerative wages.

THE IRON TRADE.

Birmingham.—The crisis of the recent unsettled state of the iron-market seems at length to have been reached and passed. A decided decline has taken place. This is attributed in a great degree to the increase of discounts by the Bank of England, but there are, unquestionably, causes which must of themselves, without reference to the Bank, have produced the same result. Iron purchased at low rates, upon speculation, has found its way into the market, and, as was expected, a reduction in value has ensued. Orders have been given and taken for bars at *10l.* 10s. per ton, delivered in Liverpool. One house, it is stated, sold 11,000 tons of pigs at *6l.* per ton. There is no doubt, however, that the scarcity of coal, now most severely felt in South Staffordshire, will assist in keeping up good prices, and no further reduction, at least to any serious extent, is anticipated. The ironmasters are represented as traversing the district in every direction in search of coal, and state that some of the works must ultimately stand for want of material. Good ironstone is also in great request, at from 20s. to 23s. per ton.

Manufacturers cannot pay *11l.* per ton, and compete with the American market. Two American buyers, who arrived at Birmingham by the last steamer, with extensive orders, have declined purchasing at the prices required by merchants for manufactured goods, alleging that they cannot realize the advance with certainty. There are also several very extensive Canadian

orders unexecuted in the town, and not likely to be forwarded until further instructions are received, all which delay is attended with considerable embarrassment to parties on both sides. The Australian freight is also becoming a question of considerable importance. A few months ago we were daily in receipt of circulars soliciting consignments at 20s. and 25s. per ton, and now 5*l.* per ton and upwards freight are required. The *Formosa* has brought over some large orders from Sydney and other parts of Australia, and the letters by the same vessel will still further add to the tide of emigration, which will immediately set in from this district.

In some respects it is fortunate for the general trade of the district that a reduction in the price of iron has occurred. Commercial men state, that when upon their journeys, they find it impossible to obtain from their customers an advance on the manufactured article in proportion to the advance in price of the raw material. Ironmongers insist upon paying at the old rate of figures, and are extremely reluctant to understand how it is that the factor and merchant are compelled to enhance their price-lists. This causes great inconvenience and annoyance to the Birmingham traders. Business, in some instances, has been greatly interrupted, and orders with difficulty obtained.

The export trade is increasingly prosperous, and the advance of price does not appear to have affected the foreign trade of the town and district. The Government returns just published show an increase of 12,000*l.* in hardware, and this bears no proportion to the increase in other metals. The export of iron from December, 1851, to December, 1852, increased from 369,000*l.* to 582,000*l.*, the excess being no less than 212,000*l.*

Glasgow Pig Iron-market,—Glasgow, January 22.—Since this day se'nnight pig-iron has fallen 10s. a ton, quite a panic prevailing during the week, caused by the expectation that the Bank would advance its rate of discount; on this being announced, a better feeling was manifested, much less iron being pressed for sale, and to-day we close firm, warrants, nominally, 59s. cash, better prices being expected in the course of next week.

America.—Nothing worthy of notice was transpiring in the New York iron-market up to the 14th inst., the latest date of the advices brought by the *Asia*, which arrived at Liverpool on Wednesday last.

The Montour Rolling-mill, in Pennsylvania, is now running up to her utmost capacity on heavy rails. The Rough and Ready Rolling-mill is running on small rails and merchant iron. Three anthracite furnaces are in blast in this region, and two more, lately repaired and enlarged, will be blown in next week. Two others are to be enlarged and repaired, as soon as may be, and put in blast. This will make seven anthracite furnaces in this vicinity, and the hot blast fixtures, lately arranged and to be arranged, are put up with a view to the building of two more furnaces. "When these improvements are completed," says the *Danville Intelligencer*, "we will have nine anthracite furnaces in this vicinity—supposed to be the best location for making iron in the world. The Montour Company are now laying the foundation for another rolling-mill, 200 feet long, with a view to doubling their capacity to make railroad iron. These and other improvements going on here, once completed, it will be idle for any other iron region in the United States to show facilities for the manufacture of iron equal to those of Danville."—*Scientific American.*

HISTORY OF INUNDATIONS IN THE UNITED KINGDOM.

The long-continued floods to which the whole country has been subject, and the remarkably heavy storms of the summer suggest a record of the inundations to which Great Britain has been subject. The earliest inundations in the United Kingdom recorded is one of the sea, in Lincolnshire, A.D. 245, which laid under water many thousand acres that have not been recovered to this time. In the year 353 another took place in Cheshire, when 5,000 persons and innumerable cattle perished. In 738 a flood at Glasgow drowned upwards of 400 families. A hundred years later the Tweed overflowed its banks, and laid waste the country for thirty miles round. In the year 1015 says Speed, a prodigious inundation of the sea on the English coasts demolished a number of seaport towns and their inhabitants. We have Camden's testimony that the Goodwin Sands were produced by inundation. "Earl Goodwin's lands, exceeding 4,000 acres, overflowed by the sea, and an immense sand-bank formed on the coast of Kent, now known [A.D. 1100] by the name of Goodwin Sands." More than 300 houses were overflowed by the sea at Winchelsea in 1280. Hollinshed chronicles that the Severn overflowed during ten days in 1483. The flood carried away men, women, and children in their beds, and covered the tops of many mountains. The water settled upon the lands, and were called the Great Waters for one hundred years after. Again,

in 1607, the waters rose above the tops of the houses, and above one hundred persons perished in Somersetshire and Gloucestershire. The Ripon flood, of 1771, will be recalled by Yorkshire people still living. An inundation of the Liffey did immense damage in Dublin, Nov. 12, 1787, and Dec. 2 and 3, 1802. The bursting of a cloud during a storm, in May, 1811, over Salop, caused many persons and much stock to perish. Destructive floods were occasioned in Strabane, Ireland, by the melting of snow in January, 1816. In England, 5,000 acres were deluged in the Fen counties, in 1819. Comparatively recently (1841) Brentford and the surrounding country was visited by an inundation, by which several lives were lost and a considerable quantity of property destroyed. There is no authentic record, however, of a stormy and rainy season so long continued as that of the present year, which, it is to be hoped, has now terminated.

STEAM NAVIGATION OF THE DANUBE.

The *Pesth Gazette* gives an account, which is full of interest, of the vast extent to which the restoration of tranquillity, and the operations of commerce resulting from it, have developed steam navigation on the Danube, the great artery of Southern and Eastern Europe. It appears that the fleet of the Danube Steam Navigation Company already consists of 85 steam-vessels, of the collective power of 9,517 horses, together with 300 flat-bottomed cargo vessels. These are actively engaged in the transport of passengers, goods, and cattle on the Danube and its tributaries, and are under the most perfect system of arrangement and supervision. The vessels are almost entirely constructed of iron, and have been built at the Company's own building-yard at Alt-Ofen, where upwards of 2,000 men are in constant employment. The steam machinery is from the workshops of the most celebrated London and continental engineers, and that which is described as being best adapted for the peculiar service of a river, abounding, as the Danube does, with shoals and bars, is from the factory of Messrs. John and Alfred Blyth, of London. The engines supplied by this establishment are of 100-horse power, and have been fitted on board the *Gonyo* and *Waitzen*, and are described as having imparted to those vessels more speed than has been obtained from smaller vessels with engines of 120 and 150-horse power by other engineers. The speed of the cargo vessels has been rendered by these engines equal to that of the swiftest passenger vessel on the river. The Company have given extensive orders to the same engineers for other ships now building, and have promised to have six other vessels with engines by the same makers in operation early in the present year.

Messrs. Blyth have already supplied dredging-machines, which are at work on the Danube, excavating the shallows of the stream; and to the great success of these efforts may be ascribed the high expectations which the Company entertain, that ere long the river navigation will, under their auspices, present all the regularity and speed of railway travelling, combined with that safety and comfort which the superior accommodation of steam vessels alone can afford.

GREAT BLAST IN THE ISLE OF WIGHT.

The Blackgang Cliff, in the Isle of Wight, was blown up on Wednesday last. Eight holes were bored, and filled with about 2 cwt. of powder, seven of which were fired and caused a vast quantity to fall; but the most prominent part and the most weighty still remained. This piece, in which was bored the eighth hole, was rent away from the body of the cliff at the top about five yards. Mr. Dennis placed his life in most imminent danger, by putting an iron bar across, and crawling on it to set fire to it; and in about two minutes a very loud report warned the bystanders, of whom there were about 150 present, that it would fall; and it certainly was a grand sight, for some hundredweights seemed for a time suspended in the air, and then fell with a tremendous crash. One piece measured 4,992 cubic feet, and, reckoning the usual weight of fourteen feet to a ton, would make it upwards of 350 tons. Several other pieces, of from 50 to 150 tons weight, also fell, and are lying on the ground. This tremendous weight, on land which was completely saturated with water, as most of the land in the Undercliff is, so shook it, that about 250 yards of the high-road is entirely gone, and the common, for some distance round, is completely rent in pieces; thereby shutting out the thoroughfare from Ventnor to Blackgang, which cannot be remedied for some time to come, and not without an enormous expense. The only road to Blackgang now is through Godshill, which is about twice the distance (we mean from Ventnor; of course it has not altered the road from Ryde and Newport); but long as the distance may be from any part of the island, it would well repay any one to go and see it. This, we hope, will be a warning to the Commissioners not to listen

to timid people about such things being dangerous, when it took 4 cwt. of powder to bring it down; and now it is down it will cost the inhabitants of the island (not those who made unnecessary complaints to the injury of others) at least 1,000*l.* to repair the road.—*Isle of Wight Observer.*

THE beautiful metal gates designed and cast by the Coalbrook Dale Company for the Great Exhibition of 1851—through which so many millions passed as they entered from the south transept—have just been erected as a new entrance from the extreme west-end of Rotten-row into Kensington-gardens. They nearly front Gore-house, and command the new Broad-walk, so prettily completed by the spire of the Gothic church in Hyde-park-gardens.—*Globe.*

Holmfirth Mechanics' Institution.—Richard Cobden, Esq., M.P., has promised to preside at the annual *soirée* of the Mechanics' Institution, at Holmfirth, the week after next.

AITCHISON, EVANS, AND FEARON'S SMOKE-CONSUMING FURNACE.

DURING the past week some highly satisfactory experiments have been performed by the proprietors of this patent, Messrs. Aitchison, Evans, and Fearon, before several public bodies, to whom the invention is of importance. Two models of the apparatus were placed on the deck of one of the Iron Steam-boat Company's vessels for examination. The gentlemen present were conducted to the engine-room, and there shown its general arrangement and mode of operation, which is generally as follows. A current of air is admitted under the fire-bars through a small aperture, which has a slide, or regulator, and by passing first through the fires and then upwards, becomes hot air, which, coming in contact with the carbon in the smoke-chamber, produces its immediate ignition. To similar inventions of this nature there has always been the objection, that cold air admitted at various points is injurious to the boilers, causing scaling, and ultimately bursting. The invention has answered the expectations of the patentees, and appears to have given satisfaction.

Amongst the company officially present were—Captain Milne, one of the Lords Commissioners of the Admiralty; Sir Baldwin Walker, Surveyor of the Navy; Mr. Loyd, Inspecting Engineer, Somerset-house; Mr. Leach, from Navigation Committee; Captain Rowland, Chief Harbour-master; Captain James, ditto; Alexander Gordon, Esq., Fludyer-street, Westminster; Messrs. Calvert, London-bridge; Mr. Howell; Mr. Rundle, and many other scientific persons.

PIIL'S CHEMITYPIC PROCESS.

SIR,—In the Austrian Department of the Exhibition of last year there were specimens of the results of Chemitypy. In the "Brief Survey" I find the following account of this process of engraving, which is said to have been discovered by a native of Copenhagen, named Piil, and brought to perfection by him in the Imperial Establishment.

"A zinc plate is taken and covered with etching ground, the plate is then etched, and the surface covered with an easily fusible negative metal; the plate is then scraped, so as to leave the metal in the hollow parts produced by the etching; the surface of the plate is then again etched, to remove part of the zinc plate for the elevation of the design. The plate is now, like a wood-cut, fit for printing." (P. 5.)

The above description of the process is somewhat vague, and perhaps was intended to be so. I have seen a small map of the neighbourhood of Dresden executed in this style, which very far surpasses anything of the kind produced by wood or glyphography. It is unfortunate that we do not know what "easily fusible negative metal" to employ. I am told that type-metal may be used, but I have not yet tried it. For the present I am desirous of calling particular attention to this process, which promises to be of the greatest utility for illustrations of scientific works, maps, &c., but I have no expectation of its ever becoming a rival of wood in an artistic point of view.

I am, Sir, yours, &c.,

B.

Jan. 24, 1853.

[We insert the above letter, thinking with its author that the subject well deserves attention. The "Brief Survey," from whence this short description is taken, we cannot at the moment refer to, nor would it seem to be necessary; the description being clear so far as it goes, and only deficient in not naming the metal or alloy actually used by the artist. That many such are available for the purpose we do not doubt. The plate is zinc, and the etching in both stages of the process is made upon it. Nothing need be said as to the first of these. The difficulty in the way of our correspondent is the metallurgical operation interposed between them by means of which the depressions of the surface left by the first etching

become filled by another metal, which, when the second etching is being effected, shall be protected electrically by the zinc. The condition of each element in the voltaic circuit is dependent on the other elements, so that the same metal may be positive in one combination and negative in another. In the present case, the metal to be sought for must possess these properties. Its fusing point must be lower than that of zinc, and it must be capable of chemical union with, or must solder to zinc. When exposed in actual contact with zinc to the corroding or etching fluid, it must not be affected thereby. Type-metal might possibly answer the purpose, so might the ordinary fusible compounds of tin, lead, and bismuth, or perhaps pewterer's solder. In the absence of direct information on the subject, we should recommend trials of these alloys, as being of easy manipulation and promising a successful result.]

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair. The discussion on the preservation of timber was renewed, by the exhibition of specimens of timber, rendered uninflammable, by Sir W. Burnett's process (Chloride of Zinc). It was stated, that in the most intense fire, timber, or even linen, so prepared, could only be charred, and would never burst into flame.

The President fulfilled his promise of procuring, from Southampton, portions of unprepared, and of creosoted timber, which had been attached to the worm-eaten piles of Southampton Royal Pier, in February, 1848, below the level of high water of spring tides. The specimens showed, that whilst the unprepared and the "Payneized" timber was entirely converted, by the worm, into a mass of disintegrated fibre, the creosoted timber had not been touched by those insects. An offer was made to attach, in an identical position, specimens of timber prepared by any process, and to bring them, after a given time, before the Institution, to enable the merit of the system to be practically ascertained.

The President directed attention to the Dublin Exhibition, and Mr. Roney (the Secretary) stated that the undertaking was progressing most favourably, the original size of the building would be nearly doubled, and to meet the additional outlay, Mr. Dargan had increased his donation from 20,000*l*. to 50,000*l*.

It was believed, that the department of machinery in motion would be quite as interesting and attractive as that in the Great Exhibition of 1851, in London.

The Society of Arts had determined, that their East Indian Exhibition, and all the influence of their Body, should be transferred to the Dublin Exhibition. There would also be a Mediæval court, and an Archælogical collection, which would show that Ireland, though of late years not progressing so rapidly as this country, was, in former times, a country possessing high attributes of civilization. There would also be a fine collection of ancient and modern pictures of every school. Mr. Roney concluded by soliciting the members to aid the Exhibition by the loan of models, whether working or stationary, and of works of art, of which great care would be taken.

The following Paper "On the Construction of Fire-proof Buildings," by Mr. James Barrett, Assoc. Inst. C.E., was then read.

The author first introduced some remarks on the use of timber, for building purposes, referring to its injurious effects in weakening the walls of buildings, its combustiblity, and its liability to dry-rot and the ravages of insects. The great loss of life and the vast destruction of property, resulting from its too common use in buildings, rendering essential some strong measure, by which the public safety would be insured.

The iron-girder and brick-arch system of construction was then referred to, and the evils, which might result from the adoption of that principle, were exemplified by reference to the fall of the Cotton-mill at Oldham, in 1845; where the lateral thrust of one of the arches having fractured a cast-iron beam, had caused the sudden destruction of the entire building; the author contended, that a system liable to produce such calamitous results, could not be regarded with that degree of confidence which should be felt, where many lives and much property were at stake.

The Paper then proceeded to describe the system of fire-proof construction, which had been to some considerable extent adopted, as a substitute for the usual methods of building, and as a remedy for the defects complained of. The chief objects to be accomplished were described to be, making each floor of the building fire-proof, so as to prevent the communication of fire from story to story, avoiding all lateral thrust, or weakening effect upon the walls, securing the building from the attacks of dry-rot, giving increased durability to the structure, and rendering it at the same time practically sound proof; combining these advantages, at the same time, with simplicity and economy of construction.

In accomplishing these objects, joists of wrought or rolled iron, of an improved form, combining lightness with great strength and economy, were used; and by the employment of layers of incombustible materials, chiefly concrete, supported by and consolidated with the joists, a strong and solid fire-proof foundation was obtained, upon which any description of finished surface, adapted for a floor or roof might be laid. The various parts of the structure having been minutely described, it was stated that, in point of strength, the floors, even of an ordinary dwelling-house, constructed on this principle, would, if crowded to the utmost possible extent, be loaded with only one-fifth of their breaking weight.

The various applications of the system to such buildings as Guy's Hospital, King's College Hospital, the Training College, Chelsea, and the Flax-mills, at Newry, the spans of which were considerable, were then detailed: these consisted of the use of girders of cast-iron, with minor joists of the same material; of boiler-plate girders combined with cast-iron joists, the whole of the additions to Guy's Hospital having been built in this manner; and of boiler-plate girders combined with rolled iron joists; the latter method providing for every possible contingency, whether as regarded width of bearing, strength of floors, or liability to impact, or vibration; and in cases where the use of columns could be admitted, to shorten the bearings, both girders and joists of rolled iron were employed; this latter application referring chiefly to mills, warehouses, manufactories, and similar buildings.

The fullest details were given of the actual as well as the relative cost, as compared with other floors, under all circumstances; and it appeared from a detailed comparative statement of the cost of different floors for domestic buildings, given in an appendix to the paper, that substantial and well-constructed timber floors were actually more costly than the fire-proof floors finished with a surface of cement; and that the fire-proof foundation, finished with the ordinary boarded surface was, on the average, very little more expensive than ordinary timber floors.

A comparative statement of the cost of a floor for a mill, or factory, formed in three different ways, namely, with timber, with cast-iron girders and brick arches, and with girders and joists of rolled iron, showed a decided economy in the use of the latter system, as compared with cast girders and arches.

The Author, in conclusion, referred to the difficulties attending the introduction of any innovation in the ordinary arts of life, and cited instances where great improvements were only fully recognised after the lapse of years, when prejudices had died away. He stated the subject to be one of great importance, considered merely in a commercial point of view, from the fact of nearly half a million sterling being annually paid, in London alone, for fire-insurance, exclusive of the duty, adding the well-known fact, that upwards of one thousand fires occurred annually in the metropolis, and that more than half of those which reached the structure of a building were considered to have originated in defective or over-heated chimney-flues acting upon the timbers. It was contended, also, that whilst the general adoption of a system of fire-proof construction would prove a remedy for that fruitful source of crime, incendiarism, it was a question if insurance companies themselves would not ultimately be considerable gainers, and, it was added, that though in the course of his remarks objections had been stated to the use of cast-iron girders and brick arches, yet that it was rather to bring fire-proof construction within the reach of every one, than to offer any particular system in opposition to other methods, that the plan had been introduced. This plan, however, was not to be looked upon as a mere theory, but as one, the value of which had been practically demonstrated for many years, and applied to every variety and description of building; and it was not one of its least recommendations, that its adoption would greatly extend the use of a material, the whole of the cost of the production of which was spent in employing home-labour.

The following Paper was announced to be read at the meeting of Tuesday, Feb. 1, "On the Pneumatics of Mines," by Mr. Joshua Richardson, M. Inst., C.E.

APPLICATION OF THE PROCESS OF *DEPLACEMENT* IN MANUFACTURES.—PART II.

BY A PRACTICAL CHEMIST.

The figure (No. 1537) is intended to represent the apparatus in operation. The substance to be acted upon is supposed to occupy the lower half of the inner vessel B, and upon it is placed the perforated diaphragm D, which should fit with sufficient exactness to keep its position when its removal is not desired. The upper portion of the vessel B receives the displacing fluid; and, if the stop-cock E be closed, it

will pass downwards through the mass below, with a greater or less rapidity according to circumstances, some of which we shall have to consider. Its descent will, however, be gradual, and, in an apparatus of glass, perceptible in a somewhat instructive manner. After a certain time, moisture will exude through the bottom C. This will gradually fill the small space between the two vessels, until it rises to a level with the fluid within the vessel B. It will now remain at rest until the stopcock E is opened, through which it may be drawn at will.

This operation has been properly called *déplacement*, because, in many instances, the fluid so made to descend through the matter acted upon has displaced the essential principles it contained, scarcely, if at all, combining with them, but merely taking their place in the matter; so that the first product has contained scarcely a trace of the fluid employed, but presented all the characteristics of the substance treated in a degree of concentration not otherwise of easy attainment. If the operation be continued, successive portions of the displacing fluid will descend, and percolation will exhaust the material of all soluble principles in a rapidly decreasing state of concentration, until the fluid passes unchanged.

In order to compare this process with the old plan of maceration, we have only to consider that the latter consists in exposing the material to a fluid menstruum, in such a proportion as may be thought necessary, for a longer or shorter time, with frequent agitation. When saturation is supposed to have taken place, the fluid product is separated by filtration, decantation, or otherwise, the solid residue subjected to pressure, and after that, when spirit is used, sometimes to distillation, in order that nothing should be lost. If the point of saturation be under the requisite concentration, as often happens, evaporation must be resorted to, with less both of quality and quantity in the product. This tedious tissue of operations, altogether taking up weeks, sometimes months of duration, are better effected in a few hours by a judicious application of the principle of *déplacement*.

The process of mashing in the brewery is a combination of maceration and percolation, and requiring much precision and nicety in consequence of the complexity of the material operated upon. Malt would seem to the superficial observer a simple affair to deal with. In practice, however, much experience, and no mean degree of chemical skill are needed to insure at the same time a good product and a perfect economy. The conversion of grain into malt, we need scarcely say, is effected by an incipient growth, or development of the vital principle of reproduction, which is checked at the proper stage by an increase of temperature approaching torrefaction. At this stage a great change has taken place. The grain is now found to contain a notable quantity of sugar, no trace of which was there before germination had been induced. We need not pause to enter further into the *rationale* of malting, but proceed to say that, the malt being made, the brewer has to eliminate from it, by infusion with water, all its soluble components. To this process there are opposed some circumstances not always easy to obviate, but which, under skilful management, yield to an old-fashioned practice, which though not properly *déplacement*, very nearly resembles it. Therefore we pass this part of the brewery, and proceed to another of scarcely less importance, in which we may find something to write about. There are two ingredients necessary to good beer—malt and hops. The malt seems to be treated with due consideration, but we apprehend there is sad havoc made with the hops. The simple infusion of malt (sweet wort) is an aqueous solution of organic products, which are more or less convertible into alcohol by fermentation. We have said that the process of malting is used as preliminary to brewing, for the purpose of converting certain compounds, in which the grain mainly consists, into sugar. This conversion is only suffered to proceed to a certain extent; because, if allowed to go beyond it, other consequences of a kind detrimental to the ultimate product would follow. We may assume that the infusion of barley-malt is composed of sugar and starch mainly; and the object

of the brewer is, through the agency of fermentation, to convert as much as he can of these compounds into another arrangement of their constituents, which is spirit, alcohol, or the intoxicating principle *par excellence*. Now, it happens that the process of fermentation in a fluid compounded as malt-wort is, will not, without certain artifices, stay its progress just at the point the brewer aims at, but will go on until the alcoholic beer becomes vinegar—the acetic stage—and if not then arrested, it will go a stage further—the putrefactive; during which it will give off offensive gases, and become at last water, with a muddy deposit incapable of further spontaneous change.

Experience has shown that if, previously to the fermentation of wort, certain vegetable bitters be intimately combined with it, the fermentation may be permanently arrested at the point of desired attenuation. Let us explain "attenuation." The brewer first loads or charges the water with the soluble matters before spoken of, so that its weight becomes greater. This state of heaviness is conveniently called "gravity," and its degree, on comparison with pure water, indicates with great exactness its value for the ultimate object, inasmuch as the heavier or richer it is, the more convertible material does it contain. Now, then, this solution is subjected to fermentation, the process by which this heavy charge is converted for the most part into the light fluid, alcohol, or pure spirit. Of course, as this conversion goes on, the gravity becomes less, until it meets the wish of the manufacturer, at a point which experience has beforehand determined. It is precisely at this point that further chemical change should cease; and here the vegetable bitter, under the control of intelligence, keeps it in the form of the agreeable beverage,—beer.

We have spoken in general terms of the vegetable bitter principle; but it is found that all bitters of that class are not equally efficacious, and of all yet used, the hop, although once interdicted by Act of Parliament, is found by far the best. Some alarm has lately been excited by an ignorant rumour that that miserable compound, bitter ale, was not what it really is, a beggarly Jack Spratt's substitute for generous beer, in which the malt is nearly forgotten, but a decoction of nux-vomica, or solution of strychnine, which most certainly could not answer the purpose, even if it were not, as it is, a deadly poison.

The hop, then, being the deserved companion of the malt, let us see how the treatment of the brewer accords with the habitudes of those principles upon which its excellence depends, and point out, if we can, a better mode of proceeding.

It must be more or less known to our readers, that the culture of the hop-plant is the staple of some of our most interesting agricultural districts. The "strobyle," or pendant plant, in a state of perfect development, so gathered, dried, and packed, as to enter the market without deterioration of colour, strength, or flavour, is the great object of the grower.

The superior value of the English hop is the measure of the farmer's success, and, on a fair average, the aroma, essential, or flavouring principle of English hops, a volatile oil, is equal to from 6 oz. to 8 oz. per cwt. The bitter principle before spoken of is in much greater proportion.

This is the ingredient which enters largely into the composition of beer, and to which its slight bitterness is owing. The flavour, or hop-taste, is due to a remnant of the volatile oil just now alluded to. The character of the beverage is dependent in a great measure upon the proportion of this principle. It is the flavour of the hop, and is so associated with the popular *idéal* of beer, as to be quite indispensable in the better specimens.

We are now about to show that the practice of the brewery involves an almost entire dissipation of this principle.

The introduction of the hop occurs at that stage in the process of brewing which intervenes between the mashing and the fermentation. It will be necessary to refer to the product of the first process,—mashing,—in order to understand what follows. The wort, as already stated, is a solution, or perhaps more properly, a fluid holding partly in solution, and partly in suspension, sugar, starch, &c., &c. If, in

mashing, the water were at the boiling point, the starch which the grain still contains would combine with it to form a viscid compound, in no degree susceptible of *déplacement*, or removal by percolation from the mash-tun. The temperature at which the water is used is, therefore, not allowed to exceed, and is, in many cases, kept below 180°. At this temperature the sugar is readily soluble, and the starch suspensible in a granular condition, quite amenable to the deplacing process, and thus the valuable portions are abstracted in a state admirably fitted for further manipulation. If the wort so obtained be now subjected to a temperature at or above 212° for a certain time, the starch combines with the water, and the sugar already dissolved therein, and by an operation not at all understood, but learnedly talked of under a name—"catalysis" (names go a great way), it becomes obedient to another law of change through fermentation.

It is this operation of boiling the wort, without which the operation would fail, of which the brewer avails himself to introduce the hops. The boiling the hops is not the object, but the boiling the wort is unavoidable. If any of our readers should on certain days in the week pass from the city over the Southwark-bridge, and up the road on the Surrey side, Messrs. Barclay and Perkins will give them abundant proof of the assiduity with which they are dissipating the best portion of the vast quantity of hops they consume.

If, instead of submitting the hops to the continued boiling to which they are thus subjected, they were reduced to a coarse powder placed in a *déplacement* vessel under a head of boiling water, or boiling wort, the temperature being sustained by a surrounding steam jacket, or otherwise, until the water or wort passed without change, and if the resulting product were added still at a boiling temperature to the boiled wort before it has cooled, a combination of all the essential principles would be ensured with the least possible loss. The apparatus, of which we have given a figure, would effect this object on a small scale. The modifications necessary for a more extensive application of the principle are such as will readily present themselves to those who are likely to need them.

[We avail ourselves of the circumstance of the author having indicated the mode of applying this principle to other purposes than those originally contemplated by him, to add the still remaining part of his paper to that with which he has again favoured us, and to continue the subject in our next Number.]

CARPENTER'S SCREW PROPELLER.

On Thursday last we were present at a trial trip of the steam tender of Captain Leyland's yacht, the *Sylphide*, which has been fitted with Captain Carpenter's duplex propeller, patented by that gentleman in 1851. This arrangement requires an alteration in the form of the vessel, consisting of two parallel keels below the midship section, and two dead-woods, stern-posts, and rudders. Instead of having a screw in the midship channel, there is one in each deadwood of contrary pitch, and these derive their greater efficiency from the circumstance of their working in water of better condition for re-action. This form of construction enables the vessel to have a considerable width at the stern, and at the quarter, rendering it more available for freight and general convenience, and the tender of the *Sylphide* may be considered as a successful illustration of this advantage. Her length is 45 feet, breadth 8 feet, and tonnage 13⅜. She draws 2 feet 6 inches of water, and the area of her midship section immersed is 14 square feet. It was intended to fit her with rotary engines on Fitzmaurice's construction, but time becoming shortened previously to the departure of the *Sylphide* for the Mediterranean, she was supplied with two small oscillating engines for land purposes, which, though adapted to her with great judgment by Messrs. Finney and Hunter, of Blackwall, are far from being calculated to exhibit fairly the working of the invention. Their collective power is 8 horses, which gives the unit of power on the immersed midship section ·58 lbs.

The tender left the Brunswick-pier at Blackwall at various times during the day, taking on board several parties of naval and engineering gentlemen, among whom were Colonel Colquhoun, R.A., and Mr. Chatfield, of the Admiralty. She steamed down the river with an easy motion, notwithstanding the swell occasioned by the steamers passing, which good result seems

referable to the mass of still water between the sterns opposing the tendency to roll. No attempt was made at a trial of speed, as the shafts only made 104 revolutions per minute instead of 150, and the object in view was mainly to exhibit the facility of general management she admitted of, which proved in every way satisfactory. The gearing multiple is 2·1, and the diameter of each screw about 2 feet. Under these circumstances the screw makes an average speed of 7·6 miles per hour, and the boat of 6·1 miles per hour. This gives a large positive slip; but the inefficient character of the engines must be remembered, and the fact, also, that a portion of one of the screws had been broken off. She answers her helm perfectly, even in going astern—a difficulty seldom, if ever, got over by steam-vessels. So energetic is the action of the two rudders, that the tender can be brought round in a circle whose diameter is less than twice her length, and, in peculiar circumstances, great advantage might be derived by throwing one of the screws out of gear. The tender left with the *Sylphide* for the Mediterranean immediately afterwards, her trial being deemed quite satisfactory by all who witnessed it.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING JANUARY 27, 1853.

Henry John Gauntlett, of Charlotte-street, Portland-place, Middlesex, doctor in music. *For improvements in organs, seraphines, and other similar instruments, and also improvements in pianofortes.* (A communication.) Patent dated July 15, 1852.

The first part of this invention consists in transmitting the movements of the keys of organs to the pallets or valves of the pipes, by means of an electric arrangement which enables the usual complicated mechanism by which this is effected to be dispensed with. The patentee has described an electro-magnetic arrangement for this purpose, in which the depression of the key is made to complete the electric circuit, and thereby to cause the electro-magnet to attract its armature, which is attached directly to the pallet or valve, and thus to open the valve and sound the required note. A similar arrangement is capable of being adopted for working the stops, &c.

The second branch of the invention applies to barrel-organs, seraphines, and other free reed instruments, where the electric current is applied to act in a similar manner; and to pianofortes where an arrangement such as that described is used, to bring the hammers into action and strike the strings.

Moses Poole, of London, gentleman. *For improvements in boots, shoes, clogs, and similar articles.* (A communication.) Patent dated July 15, 1852.

These improvements have relation to boots, shoes, &c., composed of India-rubber, and consist principally in the mode of forming the soles of such articles, which are made double, a space being left between the insole and outsole, and the former perforated for the sake of securing ventilation.

George Hinton Bovill, of Abchurch-lane, London. *For improvements in manufacturing wheat and other grain into meal and flour.* Patent dated July 15, 1852.

Mr. Bovill's improvements comprehend

1. A mode of driving two ranges of millstones from a central horizontal shaft, by means of half-crossed straps, which pass from the horizontal shaft to riggers or pulleys on the vertical spindles of the ranges of millstones.

2. An arrangement for drying manufactured meal and flour by means of steam and hot air, instead of kiln-drying the grain previous to grinding.

3. A mode of applying steam to give moisture to manufactured flour, which after grinding is in too dry a state.

4. An arrangement for washing grain, to separate its impurities, and then drying by currents of hot air.

5. A mode of employing, exhausting, or forcing machinery in combination with millstones, having apertures covered with wire gauze or other perforated material, in order to facilitate the passing away of the ground flour through such apertures.

6. The employment of exhausting apparatus in combination with millstones, having horns or ventilating contrivances revolving with them.

Charles James Pownall, of Addison-road, Middlesex, gentleman. *For improvements in the treatment and preparation of flax and other similar fibrous vegetable substances.* Patent dated July 15, 1852.

The patentee describes and claims—

A mode of subjecting fibrous vegetable substances to repeated mechanical pressure, and the action of a stream of water for the purpose of depriving them of resinous or gummy matters, and also resolving them into their ultimate or finer fibres.

John Hunt, of Rennes, France, gentleman. *For certain machinery for washing and separating ores.* Patent dated July 16, 1852.

A description of Mr. Hunt's improved machinery having already appeared in our pages (see vol. lvii. p. 481), we now give only the claim made in the enrolled specification, which is for—The improved ma-

chinery for washing and separating ores and minerals from foreign matters, as described, in so far as regards the introduction of a valve under the forcing-box, and the combination and arrangement of machinery, whereby water is forced in sudden jerks through pierced copper plates or sieves, and sets the ore or mineral matters thereon in motion in such a way as to cause each kind of ore or mineral to be separated according to its respective specific gravity.

STRIBBLEHILL NORWOOD MAY, of Fitzroy-square, gentleman. *For certain improvements in the manufacture of thread, yarn, and various textile fabrics, from certain fibrous matters.* Patent dated July 20, 1852.

This invention consists in manufacturing thread, or yarn, and textile fabrics from the fibre obtained from the plantain, banana, aloe, vacois, rajmar, penguin, and all other textile plants and trees indigenous to a tropical climate.

The plants and trees are first crushed by pressure between rollers or by other means, and the fibres are obtained by scrapers, brushes, or combs, and spun upon the ordinary flax or tow machinery alone, or mixed with other materials, such as silk, &c. The fibres are soaked, previous to being spun, in a bath of salt and water, so as to cause them to separate from each other, and assume a more suitable condition for being operated on.

Another use to which such materials may be applied is the manufacture of paper, in which case they are used either alone or in mixture with rag-pulp ordinarily employed.

WILLIAM FAWCETT, of Kidderminster, Worcester. *For certain improvements in the manufacture of carpets.* [This patent being opposed at the Great Seal, was not sealed till July 17, 1852, but bears date February 3, 1852, by order of the Lord Chancellor.]

The peculiarity of this invention consists in using a single thread only with two wires for forming the pile of Brussels and other piled carpets, instead of the double thread and single wire ordinarily employed. The single thread is not of greater substance than when two threads are employed, but the deficiency that would exist on this account in the body of the carpet is compensated for by the employment of the two wires.

JULIUS FRIEDRICH PHILLIPP LUDWIG VON SPARRE, of Brewer-street, Golden-square, mining engineer. *For improvements in separating substances of different specific gravities, and in the machinery and apparatus employed therein.* Patent dated July 20, 1852.

A full description of Mr. Von Sparre's separating apparatus, with engravings, will be found in another part of our present Number (*ante* p. 81).

Specifications Due, but not Enrolled.

CHARLES BURRELL, of Thetford, Norfolk, and MATTHEW GIBSON, of Rollington-terrace, Newcastle-on-Tyne. *For improvements in reaping-machines.* Patent dated July 15, 1852.

CHARLES BARRINGTON, of Philadelphia, in America, gentleman. *For an improved steam-boiler, water-feeding apparatus, and furnace therefor.* Patent dated July 15, 1852.

JOHN SHAW, of Dukenfield, Chester, cylinder-maker. *For certain improvements in machinery or apparatus for carding cotton, wool, flax, and other fibrous materials.* Patent dated July 20, 1852.

RICHARD BIRCKTON and THOMAS LAWSON, both of Leeds, York, manufacturers. *For certain improvements in the adaptation and application of a new manufactured material to certain articles of dress.* Patent dated July 21, 1852.

PROVISIONAL PROTECTIONS.

Dated January 1, 1853.

8. John Henry Johnson. Improvements in the manufacture of oils. A communication.

Dated January 3, 1853.

12. Edme Augustin Chameroy. Improvements in motive-power engines, and in the application of motive power to the same.

18. Charles John Burnett. Certain improvements in apparatus of mechanism for driving machinery through the agency of water.

Dated January 6, 1853.

31. William Louis Sheringham. Illuminating buoys and beacons in harbours, roadsteads, and rivers.

33. John Browne. Improvements in the construction of ships or other navigable vessels, and in machinery or apparatus connected therewith.

37. Michael Smith. Improvements in machinery for separating gold or other valuable substances from other materials.

29. William Edward Newton. Improvements in the construction of bearings or steps for shafts, turntables, or moveable platforms, which he denominates "Parry's Improvements." A communication.

41. Peter Graham. Improvements in the manufacture of carpets and other piled fabrics. A communication.

42. William Sykes Ward. A thermostat, or apparatus for the regulation of temperature and of ventilation.

43. William Watson, the younger. Improvements in apparatus for the manufacturing of prussiate of potash.

Dated January 7, 1853.

44. Charles De Bergue. Improvements in the permanent way of railways.

45. Thomas Pape. Improvements in circular frames, and in the fabrics and articles produced thereon.

47. Charles William Lancaster. An appendage to bullet-moulds.

48. George Stewart. Improvements in railways, and in the propulsion of engines, carriages, and other vehicles thereon.

49. Herbert George James. Improvements in the mode of securing and retaining corks and stoppers in bottles. A communication.

50. Richard Gittins. Improvements in tills.

53. Hezekiah Marshall. Certain improvements in the transmission and emission of air and sound.

52. James Egleson Anderson Gwynne. The propulsion and supporting of vessels, vehicles, and other bodies on, through, and over the water. A communication.

Dated January 8, 1853.

53. Robert Lovely. Certain improvements in the application of steam to the propulsion of carriages on common roads, parts of which improvements are applicable to the construction of carriages for common roads.

54. Thomas Smith. Certain improvements in soil-pans.

55. John Abraham. A new or improved method of manufacturing percussion caps.

56. Henry Kibble. Improvements in obtaining a communication between guards, passengers, and drivers on railways.

58. John Henry Johnson. Improvements in stoves for cooking, and in apparatus connected therewith. A communication.

60. Richard Walker. An improvement in the manufacture of buttons.

Dated January 10, 1853.

61. Antoine Hiron. Improvements in the means of copying or reproducing models or figures in marble, stone, ivory, or other substances.

62. Charles Stewart Duncan. Certain improvements in rendering bottles, jars, and other like receptacles, air and water tight, and for raising and measuring the liquid contents thereof.

63. John Deane. An improved construction of diving helmet.

64. Michael Fitch. Improvements in ovens.

65. William Webb. Improvements in the manufacture of carpets.

66. John Davies Morries Stirling. Improvements in the manufacture of percussion caps.

67. Frederick Schneider. A chair to be employed for preventing sea-sickness.

68. Alfred Vincent Newton. An improved mode of separating substances of different specific gravities. A communication.

Dated January 11, 1853.

70. William Weild. Certain improvements in looms for weaving.

72. James Thornton, John Thornton, and Albert Thornton. Improved nets and other textile fabrics, to be used for gloves and other purposes, and for the machinery to be employed in the manufacture thereof.

74. Thomas Cottrill. Improvements in the manufacture of certain salts of soda.

Dated January 12, 1853.

76. John Horrocks. Improvements in indicating and registering the number of passengers conveyed in public carriages.

78. Nathaniel Card. Certain improvements in candlewick.

82 John Arrowsmith. New or improved machinery for shaping metals.

84. George Augustus Huddart. Improvements applicable to steam generators.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 25th,* 1853.)

12. Thomas Wood Gray. Improvements in steam engines.

23. Jean Baptiste Lavanchy. Improvements in wind musical instruments where metal tongues are employed.

74. Christopher Kingsford. Machinery for solidifying peat coal, or other substances of a like nature.

87. Robert Robertson Menzies. Improvements in the manufacture of carpets and other fabrics.

172. John Jobson. Improvements in manufacturing moulds for casting metal.

442. William Newton. An improved machine for separating ores, metals, and other heavy substances from mud, sand, gravel, stones, and other impurities.

473. Julian Bernard. Improvements in the production of ornamental surfaces upon leather.

543. John Norton. Improvements in blasting.

575. Pierre Bernardet de Lucenay. The production of photographic images by means of artificial light.

882. Antonio Fedele Cossus. Improvements in lubricating apparatus.

941. Thomas Collins Banfield. Improvements in the process of, and apparatus for, extracting saccharine and other juices from beet-root or other roots and plants. A communication

963. George Frederick Parratt. Improvements in portable bridges or pontoons.

973. Richard Laming. Improvements in purifying gas, and in obtaining from the products resulting from the purification of gas certain useful compounds.

986. James Norton. An improved mode of transmitting motive power.

1015. John Sheringham. Improvements in the construction of stove grates.

1192. Archibald Douglas Brown. Improvements in the construction of portable articles of furniture.

6. Thomas Billyeald. An improvement in the apparatus and arrangement of apparatus for making looped fabrics.

8. John Henry Johnson. Improvements in the manufacture of oils, and in the treatment thereof for lubricating purposes. A communication.

11. John Bleackley, jun. Improvements in machinery to be used in washing, bleaching, dyeing, and sizing yarns and fabrics.

12. Edme Augustin Chameroy. Improvements in motive power engines, and in the application of motive power to the same.

13. Lazare François Vaudelin Improvements in apparatus for retarding and stopping railway-carriages.

39. William Edward Newton. Improvements in the construction of bearings or steps for shafts, turntables, or moveable platforms, which invention he denominates "Parry's Improvements." A communication.

41. Peter Graham. Improvements in the manufacture of carpets and other piled fabrics. A communication.

44. Charles de Bergue. Improvements in the permanent way of railways.

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78. Nathaniel Card. Certain improvements in candlewick.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their

intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS UNDER THE NEW LAW.

Sealed Jan. 20, 1853.

857. John Gedge.

Sealed Jan. 21, 1853.

17. Charles Henry Newton and George Leedham Fuller.
113. Bernhard Harczyk.
453. Frederick Richards Robinson.
489. Peter Armand Lecomte de Fontainemoreau.
528. Halsey Draper Walcott.
632. Nehemiah Hodge.
654. Richard Wright.
677. Andrew Robeson, junior.
712. Christian Sharps.
759. Abraham Rogers.
787. Moses Poole.
789. George Perry Tewksbury.
791. Richard Kemsley Day.
794. Moses Poole.
817. John Pepper, junior.
820. Samuel Hunter.
854. Edward Aitcheson and John Evans.
863. Henry Holland.
867. Charles Iles.
881. Henry Bollman Condy.
883. William Massingham.
897. George Houghton.
913. James Murdoch.
939. James Newall.

Sealed Jan. 22, 1853.

75. Laurentius Matthias Eiler.
86. David Dunne Kyle.
232. John Prestwich, the elder, Samuel Prestwich, and John Prestwich, the younger.
412. John Howard.
451. Robert Brown.
466. Robert Burns and Richard Pritchard Willett.
660. James Nicol.
729. Thomas Day.
742. Hugh Greaves.
886. Edwin Lewis Brundage.
894. William Joseph Curtis.
938. Charles Miller.

Sealed Jan. 24, 1853.

565. William Henry Fox Talbot.
568. Richard Archibald Brooman.
601. Julius Jeffreys.
617. John Macintosh.
619. George Fergusson Wilson.
683. Jean Jacques Ziegler.
737. John Paterson.
766. William Marsden.
782. John Venables Vernon and John Edge.
800. Richard Taylor.
834. Charles Watt.
900. Samuel Cunliffe Lister and James Warburton.
952. Duncan M'Nee.

Sealed Jan. 25, 1853.

20. Charles Frederick Bielefeld.
363. John Carter.
549. Bryan Donkin, the younger, and Bernard William Farey.
589. William Dantec.
907. Jean David Schneiter.
927. Robert Milligan.
951. Arthur Wall.
985. William Mayo.

Sealed Jan. 26, 1853.

691. William Gossage.

Sealed Jan. 27, 1853.

384. Joseph Henry Tuck.
456. Anthony Liddell.
716. Richard Barnes.
758. William Edward Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

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SCHLESINGER'S PATENT NEEDLE-GUN.

SCHLESINGER'S PATENT NEEDLE-GUN.

Patent dated July 20, 1852. Specification enrolled January 20, 1853.

THE arrangements described by Mr. Schlesinger in his specification, the most important of which are represented in the accompanying figures, constitute a considerable improvement on the needle-gun, or ordinary *zundnädelgewehr* of the Prussian service, and may be said to give full effect to the highly ingenious principle of that weapon, removing several of the inconveniences incidental to it in practice, and for military purposes rendering it wonderfully effective. In the ordinary needle-gun, as our readers are probably aware, the explosion of the charge is effected by darting a needle into a percussion composition placed in a wooden bottom, or *spiegel*, within the cartridge, which also contains the gunpowder and the shot. The mechanical contrivances, however, by which this is effected, have hitherto involved several defects, which have considerably diminished the many advantages which this description of fire-arms undoubtedly possesses over the ordinary percussion lock. In actual service, it will be found that the soldier has a great number of subordinate operations to perform, in the execution of which more or less time is consumed, and in the hurry and excitement of a sharp action, it is more than probable that some of these would be performed in the wrong order, and then it would be necessary to go over the same ground again. First of all, the soldier must raise the breech-handle, bring it to the left of the guider, and open the chamber. Then, by means of a catch on the second tube, he must draw the needle back. Next he must deposit the cartridge in the chamber. Then he forces the sliding tube up to the bevilled end of the barrel, and holds it there firmly and air-tight, by pressing the handle to the right against a slightly inclined face on the right-hand side of the outer guide. In this state of the process of firing, the needle is held short of the priming by a second catch of the spring on the second tube; and the soldier now forces the point of the needle into the charge, and brings the piece to the full cock. Lastly, he pulls the trigger and discharges the piece; the consequences of this last movement being the withdrawal of the bolt, the release of the spiral spring, and the instant entry of the needle into the priming composition. Thus the soldier, at every discharge of his gun, has no inconsiderable amount of attention to bestow upon the several parts of its mechanism; and whatever practice may do in rendering him familiar with it, and giving him a complete readiness of manipulation, it is undoubtedly desirable that it should be so far simplified that some of these subsidiary operations might be altogether dispensed with.

This great object has been at once effectively and elegantly accomplished in Mr. Schlesinger's invention; and his form of the needle-gun exhibits a degree of convenience and practical advantage in rapid firing, far exceeding, we should say, anything that the promoters of the needle principle could have supposed it susceptible of. In his arrangement, the act of drawing back the tube which forms the breech, brings the needle back, and so cocks the gun; so that all that the soldier has to do, is to open the breech in this manner, put in the cartridge, force it forward by means of the handle, which is then turned down in the usual manner, and then pull the trigger. In point of efficiency, this arrangement may be judged of from the fact, that the piece may be discharged twenty-five times in a minute,—of course without taking aim. This certainly combines the advantage of the breech-loading principle with that of dispensing with the act of priming, in the most admirable and effective manner.

The great points of M. Schlesinger's invention are; first, the projecting and withdrawing the needle by means of levers and springs, in combination with one or more curved or inclined planes; and second, the prevention, as far as possible, of windage, by means of a screwed tube fitting over the continuation of the barrel, and tightly held between the breech and an inclined stop.

Fig. 1 is a section of so much of a fire-arm on this construction as is necessary to show the improvements. A A is the stock, and B the barrel. C C is a tube-shaped prolongation (shown detached in fig. 3, a plan of the upper side, and fig. 4 a plan of the underside), which is screwed into the barrel B at the breech, and also secured to the stock A and under-plate by screws *a a a a*. D D′ are two tubes screwed into each other, to enable the tube D′ to be firmly fixed (as explained below), between a stop O and the breech, to prevent windage. These tubes are free to slide to and fro in the tube C, when acted upon by the handle E. F F′ are two short metal rods, which are jointed together at *b*. The rod F is hinged at *c* to the long arm G of a bell-crank lever which is centred, and turns upon a pin *d*, passed through lugs *e e*, formed in a piece with the tube D. The short arm H of the bell-crank carries at its outer end two small friction rollers *f f*. The underside of the short arm H is formed with a catch *g*, which takes into a corresponding catch in the lever I, centered upon the pin *h* in the lugs *e e*. K is a spring which bears upon the end of the lever I, and keeps the catches in contact, until liberated by the pull of the trigger, as will be afterwards described. L is the needle which is fixed in the end of the short rod F′. The point of the needle projects through a hole in the centre of a button *i*, in the tube D. The button may have secured upon the face of it a copper washer, with a corresponding hole in the centre for the passage of the needle. M is a forked spring, secured by the screw *k* to the trigger plate N. The end *l* of the lever I is formed with a hook, into which, when the arm is ready for firing, the end of the trigger lever O takes; so that when the trigger is pulled, the long arm of the lever I is depressed, the catch on the tail of the bell-crank lever becomes liberated; the forked spring then comes into play, forces up the rollers *f f*, and with them the short leg of the bell-crank lever, causing the long arm, and with it the rods and needle, to be thrust forward. The needle enters the cartridge, passing through the percussion-cap (as shown in fig. 1), and thus the charge is fired. When the piece has been discharged, the tubes D D′ are drawn back by the handle E. The rollers *f f* coming in contact with the inclined planes *n n*, on the underside of the tube C, are depressed, when the catch *g* takes into the catch on the lever I. The short arm of the bell-crank lever and the rollers *f f* travelling down the inclined or curved plane, on the underside of the tube C, necessarily cause the long arm to be drawn back, and with it the rods F F′ and needle L, as represented in fig. 2. The withdrawal of the tubes D D′, at the same time that it sets the needle L, leaves space at R to allow of a cartridge being placed in the breech in the position shown in fig. 1. The tubes D D′ are then pushed forward until the end of D′ comes over the end of the barrel *p*, which forms a collar, and abuts against the breech. The hook on the lever I is caught by the end of the lever O. The handle E is next turned down in the horizontal position for the purpose of tightening the tube D′ against the breech, and in order to leave the sight clear, and prevent the needle-carriers being forced back by the recoil consequent on the discharge.

Windage is prevented, or materially lessened, by the tube D′ fitting over the collar *p*, and being firmly held in that position until after the discharge of the arm. The shank of the handle abuts against the stop *o*, which is made to incline slightly forwards from the top. The end of the tube D′ is screwed into the tube D, so that when the handle is turned down the end of the tube D′ shall fit tight against the breech. The end *p* of the barrel B is turned thin, so as to allow of expansion when the discharge takes place. After the gun has been fired, the handle is raised and drawn back in the slot on the top of the tube C, taking with it the needle-carriers and needle as before explained.

A VISIT TO THE GREAT-WESTERN RAILWAY COMPANY'S WORKS AT SWINDON.

The extent, detail, and organization of means employed in constantly restoring the waste which occurs in the carrying on of great mechanical undertakings, and in creating from time to time the additional appliances which an increasing scale of operations imposes upon those who conduct them, convey to the mind, in very many instances, the most true idea of their real magnitude, and of the amount of energy, industry, and skill involved in maintaining them in vigorous action. It is ultimately to the workshop, the yard, the pit, or other theatre of the labours of the operative, that we must come, if we desire to see the main-springs of that wonderful, and, in general, finely-harmonized system of skilled industry, of which in every-day life we see around us so many examples. Here also, though somewhat more removed from the view of the ordinary observer, we perceive the influence of the intelligent directing power, planning new combinations of means, devising new processes which accomplish purposes of economy or of efficiency, and, in short, guiding the movements of the great intellectual engine over which it has authority. In those great centres of human ingenuity and industry from whence issue the ponderous machines which constitute the vitality of railway traffic, and which have been the means of giving so great an impulse to the cause of social progress, we find an excellent illustration of these ideas. Here we have, as it were, a grand impersonation of genius bringing together the infinite and infinitely-varied aids which the faculty of contrivance has placed at our disposal; and we see them rendered immediately available by human labour for the best purposes.

By the favour of the Superintendent of the Great Western Company's works at Swindon, Minard C. Rea, Esq., we were afforded an opportunity, a few days ago, of witnessing some of the principal of the numerous engineering operations which are performed in this vast establishment, and of observing the wonderful division of labour, and the admirable dispositions of arrangement and discipline by which so much and such critically-intricate work is performed. These works have been little more than ten years in existence, and in that comparatively short space of time they have grown to an extent, and have acquired an importance worthy the gigantic scale of working which we see in everything incidental to the broad-gauge system of locomotion. They now extend over an area of fourteen acres, which is extremely well laid out for the convenient performance of the numerous subsidiary operations which go to make up the rolling stock of a railway company. In this space, with but few and unimportant exceptions, the manufacture of new locomotives, tenders, and carriages, and the repair of old ones, are carried on. This work gives constant occupation to 1,500 hands, including fitters, moulders, smiths, erecters, and various other classes of workmen. At the present moment, more hands would be engaged if they were to be had; but the gradually-increasing demand for skilled labour has affected, in a sensible degree, the working staff of this splendid establishment. The opening of the Oxford and Birmingham line, in particular, has added very largely to the demands upon the constructive department, and, together with a gradually-extending traffic on the main line and its branches, must still further tend to augment its activity.

Swindon Works are situated upon the northern side of the main line, about 300 yards to the west of the station, where the Cheltenham, Gloucester, and South Wales line branches off upon a sharp curve. Occupying a large space in the angle included between the main line and the branch, and having a number of sidings entering from the main line, the works have a very considerable frontage on either side, and are laid out in rectangular blocks of stone buildings, separated by a number of communicating squares. Between these squares and the lower floors of the principal buildings there is a ready access with the line by means of trains of the same gauge, which communicate with it. They are accordingly filled with innumerable pairs of wheels united by their axles, which have been so accurately finished, in the lathe or by the grindstone, that a very feeble effort will suffice to set them in motion upon the level rails. In one part of the works we find the engines which impel the innumerable machines in the general shops. These are two in number, but are not in the same apartment. The one is an engine on the Cornish principle—that is, using steam at a high pressure, and condensing it on the other side of the piston. It was made at the well-known Hayle Foundry, Cornwall, and has two cylinders, nominally of 30-horse power each. The other engine is of the same power, but is on the ordinary condensing

principle. It was made originally at Bath, but has since been almost completely reconstructed here. From the crank-shafts of these engines the power is carried to all parts of the works by long shafts running underground or overground, or by straps. Adjoining the latter, is an old blower of the double-acting description, for the smiths' forges; but this has for some time been abandoned for the fan. In another place we find a number of men engaged in making the huge axles for the bearing-wheels of the locomotives, welding and beating up their component parts of iron, with the help of that most effective instrument—Nasmyth's steam-hammer. Passing further on, into another building in the vicinity, we witness the highly interesting and elegant operation of proving, or shaping the tyres. We see, too, imperfect or doubtful welds in the tyre cut through and renewed, and the metal rendered of uniform thickness and density, with the most wonderful ease of manipulation. Further on we see the manufacture of the spokes, and the formation of the inner peripheries of the running wheels of the carriages, and the metal framing of their floors. The manufacture of the tube-boilers, fire-boxes, and casing, is a department of the works on a very large scale, and of the greatest interest. In one long upper room we find forty-nine lathes, on the most modern construction, and twenty other machines for boring, slotting, cutting, and shaping the innumerable pieces of metal-work which go to make up the several parts of a locomotive engine. The grinding of the tyres for the locomotives, and especially of the great eight-feet driving-wheels now in common use on the Great Western railway, is another of the more important subdivisions of labour in this great storehouse of skill and industry. Of the more striking of these we propose to give a general description, as it will serve to convey some idea of the present state of these arts of construction in metals, at the same time that it will probably be considered a matter of sufficient interest to deserve notice. Our own limits, the vast extent and variety of the works we saw, and the very short time we gave ourselves in the place, prevent us from undertaking anything more than endeavouring to present in a popular manner the ordinary routine of operations in their more important particulars.

Before passing on to notice these, we must say a word or two with reference to the men themselves. On the south-side of the line, immediately opposite to the works, is a considerable village, of modern and neat appearance, which the wants of this community have called into existence. It has received the name of New Swindon, to distinguish it from Swindon proper, the old Wiltshire market-town, which stands upon an inconsiderable eminence about a mile from the railway. New Swindon is conveniently laid out in streets of commodious buildings, which are the residences of the men and their families. These have been drafted from nearly all the large manufacturing towns of the centre and north of England, and display in their physiognomy and general appearance a superiority over the rural population of the neighbouring country, with whom they have little, if, indeed, anything, in common. The affairs of New Swindon appear to go on with great smoothness; and, thanks to the liberal and kind treatment its principal inhabitants receive at "the Works," and the intellectual character of the work they are engaged upon, they are tolerably well reconciled to the comparatively limited enjoyments at their disposal in this isolated situation. There is one great point of attraction, however, provided for them within the precincts of the works themselves, of the most admirable character, which is undoubtedly a great source of benefit to the Company itself, as well as to the men. In the year 1843 was founded the New Swindon Mechanics' Institution, which has now attained a considerable importance, and is deservedly cherished by the men as a source at once of instruction and entertainment. Its President is Mr. Daniel Gooch; its Vice-president and Treasurer, Mr. Minard C. Rea; and its Secretary, Mr. Alfred Wickenden, under whose administration it enjoys a highly prosperous and efficient condition.

The annual *soirée* of the Institute had just taken place previously to our visit, and presented a scene of the most gratifying description. The "great room" of the works was set apart for the occasion, and was profusely decorated with flowers and evergreens, while a fountain made in the works,—very creditable in point of design,—played in the middle. On one side of the room were displayed a quantity of steam and electro-magnetic machinery, the work of the men during their leisure hours. A great number of varieties of the steam-engine were represented in this highly interesting collection, all of which derived motion from a model boiler with which their cylinders were connected. Among the electrical apparatus were two small but energetic electro-magnetic engines; one of the horse-shoe form, with a reciprocating arrangement (by a workman named Squires), employed to drive a section to scale of the engine of the Lord of the Isles; and the other a double-acting one, by another workman.

The *soirée* was attended by a very large

number of the men and their families, whose dress and general appearance indicated their being very comfortably settled. A concert of vocal and instrumental music, comprising some of the most celebrated works of Boieldieu, Mozart, and Bellini, besides some modern English, formed the first part of the evening's entertainment, which was followed by a very creditable dramatic performance by members of an amateur club formed in the institution, the remainder of the night being devoted to dancing.

Having now endeavoured to convey some idea of New Swindon and its population, we proceed at once to notice some of the more striking of their avocations, within the walls of the works.

One of the most interesting operations carried on here, is that of constructing the axles for the carriages, and for the bearing-wheels of the locomotives. As the ordinary weight of the latter, when loaded, is about forty tons, and this enormous mass of matter is frequently impelled at the rate of sixty miles per hour, it is necessary that these axles should be of great strength and perfect workmanship. The utmost care is accordingly observed in their manufacture, and the certainty of the result is in a great measure ensured by the admirable adaptation of the appliances to the objects in view; at the same time, there is a complete economy of the material employed. Old iron of all descriptions, scraps of all sizes and shapes, broken bolts, nuts, screws, eyes, bars, plates, filings and turnings, are brought together, and made into heaps of nearly equal weight, and in bulk equal to a cubic foot. These are put into the furnace, brought to the welding heat, and then beaten out into bars of the required length—about eight feet. Several of these are heated over again and welded together into one compact mass, approximating in form to that usually given to railway-locomotive axles. This is a spindle, narrow in the middle, and increasing in length towards the places for the bearings, at which the figure becomes a cylinder of smaller dimensions. The final operation, and that which gives to the fabric all the strength it requires, is exceedingly beautiful to witness. Nasmyth's steam-hammer is the machine used. The axle has a portion of its length heated in the furnace, and that portion laid upon the anvil under the hammer. To receive the axle, the anvil is furnished with a "swage," or hollow mandril, of the form which that part of the axle is intended to receive, and the hammer has a similar one to beat up the hot metal with. The weight of the hammer is 30 cwts.; and this huge mass of metal is lifted at rapidly recurring intervals through a space of about two feet, from which height it falls upon the heated axle. A chain passes round the longer end of the axle whilst undergoing this process, and over a wheel; and thus suspended, it is easily turned in the anvil-swage by means of a bar which is clamped upon it, and worked with great skill by a man who watches intently the gradual development of the form. During this operation, cold water is occasionally dashed upon the heated metal, in order, by its sudden contraction, to detach the scales from its surface, which would otherwise be driven into it, and produce a bad description of iron, technically described as "laminating." When water is thrown upon it, a sudden disengagement of steam takes place, and globules of hot water are scattered around in all directions by the fall of the hammer. A curious circumstance was mentioned to us in reference to this part of the subject. When a flat surface of heated iron is being operated upon in this manner, and water is dashed upon it, the fall of the hammer produces an explosion which is heard in the trains for a very considerable distance along the line. The explanation of this seems to be, that the great momentum of the hammer overcomes the repelling force which exists between the heated surface and the spheroids of water, causing it to flash instantly into steam under an enormous pressure, which is suddenly liberated upon the rise of the hammer, or which may even possibly be decomposed. The appearance of the glowing mass under the vigorous action of the hammer, the brilliant scintillations which emanate from it, and its gradual approximation to the desired form, invest the whole operation with a degree of interest which very much strikes the spectator who witnesses it for the first time. If the metal should cool before the part is formed, the crane by which it is suspended is swung round to the fire, and the iron is re-heated. The hammering process is now continued until the particular portion is formed, and then a new swage is put into the anvil and the hammer, which forms two other portions of the iron at equal distances from the centre. By a continuation of this process, the axle of a pair of bearing-wheels of a locomotive engine is made in something less than a working-day, and turned out of hand as perfectly as the present advanced state of the metallurgical art admits.

A further economy is exhibited in this portion of the works, by employing the same furnace to vaporize the water in the boiler, for impelling the piston of the steam-hammer, as heats the iron in the above process. This is effected simply by a judicious arrangement of the flues, which assist the combustion in the furnace itself, at the same time that they convey the vaporizing heat

around the boiler. Another ingenious expedient is resorted to for the purpose of keeping the furnace clear of slag, or scoriæ. This consists in the removal of a small portion of the wall at the back of the furnace near the ground, and surrounding the opening loosely with brick-work, having large interstices. Within this little open chamber the fire of the furnace circulates with great intensity, and so enables the slag to pass out of the main body of the furnace in a fluid state.

In the same part of the works are appliances for proving and shaping the tires of the engine wheels. Some portions of this department of the operations which we witnessed, were interesting in the extreme. A furnace, on the usual under-ground flue principle, contained a tire about to undergo the process of "forming," or "proving." The apparatus provided for the purpose consists of a large iron bed-plate let in flush with the ground, and firmly fixed in a horizontal position. Upon this plate rest five framed circular sectors, of a radius somewhat smaller than that of the tire, and these are disposed around a central space which is occupied by a conical wedge having its broader end upwards. This wedge is actuated by a slow-threaded screw working in a fixed nut below, which in descending thrusts the segments radially from it. The tire having been heated to the point at which the metal becomes manageable for this purpose, it is brought to the mouth of the furnace and sustained there by the ordinary appliances, until its flange is grasped by three hooks in which the chain from a crane close by terminates. By swinging the arm of the crane from the furnace, the tire is brought concentrically over the proving-plate, upon which it is then let down, and the hooks are removed. The men in attendance then seize a long lever which is run through the head of the screw, and walking round the plate with it force the sectors out against the inner surface of the tire, which all this time is at a glowing white heat. Their motion now becomes more slow, in consequence of the resistance of the tire, but the creaking of the metal indicates that it feels the strain, and yields to it. At length it is impossible to continue this process any longer, and for a minute or two the tire is allowed to contract against the circular peripheries of the sectors. The next step is to shape the exterior of the tire wherever necessary. This is accomplished by means of "flats," and "swages." The former are small masses of metal having a flat surface, one of which, fixed in a twisted osier, is held by one workman upon the upper surface of the tire, whilst another beats upon it with a heavy hammer, which flattens the vertical face of the flange, and at the same time removes the scales from the surface of the metal, which would otherwise produce the effect usually described by the word "laminating." Curved swages are then used for producing a uniformly curved edge to the flange; and this portion of the process, which is applicable in the case of a bearing-wheel tire, is complete. For the large driving-wheel tires, larger sectors and proportionately increased means are employed.

It sometimes happens that tires will give way in their proof, thus indicating the presence of an imperfect weld. This is a circumstance of extremely rare occurrence, but the proof is always resorted to; and a defective tire on the Great Western Railway is a thing hardly ever heard of. When a weld has to be re-made, the appliances are at hand by which it is to be done. The tire is suspended by clamps fixed upon opposite points of its figure to short chains attached to the fall from the balance arm of a crane. By means of this crane, the tire is easily swung into or out of a smith's fire, where the blast soon brings it up to the welding heat. Thus it is readily heated, re-heated, and welded up. Sometimes the edge of the flange is too thin at one or more points, and in this case it is surprising to see the ease with which the remedy is applied. The tire, suspended as before, is swung round to a suitable support, and turned upon its points of suspension into a convenient position. A thin piece of cold steel, of the size requisite to make good the defect in the tire, is then inserted in a chink, or slit, in the metal at the defective point. This operation is performed in general by the uncovered fingers of the men, the skin of which has become all but insensible to heat, by repeated exposure to red-hot surfaces of metal. We witnessed the insertion of a piece of steel into the flange of a tire, just swung out of the smith's fire at a red-heat. A man took it up in his fingers, and, after a few trials, inserted it with his own fingers. It was then lightly hammered up, the tire brought back into the fire—where the whole was heated up again, and then removed and beaten up. Operations of this kind on circular masses of red-hot steel nearly five feet in diameter, as in the case in the bearing-wheel tires, excite a strong interest in the casual spectator.

The formation of the spokes and inner peripheries of the running-wheels of the carriages is another great feature in the routine of operations at Swindon Works. In one description of wheel, two spokes are cast together in one length, with their central portions, which resemble wedges with

their apices cut off, united in the middle. The small thickness of metal in the centre is then cut through, and the wedge-shaped ends of the single spokes so produced pack concentrically round a centre, which forms the space for the nave. Another description of wheel is also made, which admits of considerable strength in the construction, and of as much facility. Bars are cast, the length of which is equal to the sum of two spokes, and the arc of the inner periphery of the wheel included between each pair of spokes. The centre of each bar has a small hole cast in it, which determines readily the position of the bar in the machine to which it is next removed, in a red-hot state, for the purpose of being shaped. This consists of a simple arrangement of levers and metal faces so disposed, that all that is necessary is to place the bar in it, with its hole passed over a fixed stud, and then to swing the levers round forcibly, which is easily done by means of two large iron balls cast upon them. When taken out of this machine, each bar is formed into a sector of the wheel, consisting of its two radii and their included arc. These sectors pack round a centre, two radii in juxtaposition uniting to form a single spoke. Around the frame thus made the iron tire is placed, the nave is added in the centre, and the whole is complete.

The construction of the iron frame-work of the carriages is carried on here in several departments of the works, though the orders for new carriages come at very irregular intervals, and are equally irregular in extent; depending, of course, upon the circumstances of traffic and of convenience which exist at any particular time. This part of the work does not present much that is worthy of notice, as it chiefly involves the ordinary operations in iron cutting, boring, shaping, punching, riveting, &c. There are one or two matters to which only it is necessary to direct attention. First, with regard to the long and broad angle-irons which form a portion of the framework of the floors. These have to be flattened out, and must have a perfectly straight line for the intersection of the two planes of which they consist. It is found that if these large angle-irons are drawn from the long furnaces in which they are heated up for flattening, with their ridge or intersection a true straight line, they cool into a curve, and are consequently unfit for the purpose for which they are destined. To remedy this, they are subjected to certain pressures, until, upon being withdrawn from the furnace, they are found to have a curved ridge of a form which is judged of with the greatest precision by the eye of the men. When eft to cool in this state, the iron comes out ultimately a combination of two flat rectangles at right angles with one another. The making of the "horn-plates," or vertical framework in which the axle-boxes are suspended by the springs, is also carried on in this part of the work. The lines are chalked out, and large punching engines, worked by cams, are employed to cut out the portions to be removed.

Passing on to another part of the works, we come to the place where the tires are reduced on their exterior, or conical faces, to the true circular form. The steel of which they are made being too hard for the chisel, the only method by which it can be touched is that of grinding. For this purpose grindstones of the ordinary kind are made to revolve with a very high angular velocity, and the tires are mounted in lathes, and made to revolve in contact with them. By this circumferential action, the formation of the tire is slowly but truly effective. The time of grinding is in general different in different tires; but a pair of tires commonly occupy a day in their completion. So great is the velocity of the revolution, a small irregularity in the friction, arising from any momentary cause, will make the grindstone fly in pieces. When this happens, the fragments of the stone are projected with considerable force; and to prevent any accident arising from this circumstance, large sheets of iron are suspended above and in front of them, which prevent the fragments from being thrown in the direction in which workmen might approach.

To the principal lathe-room we have already adverted. The collection of machines of this class is of enormous value; many of them of recent manufacture, and all of them kept in the finest order. In passing through the room, several portions of the work of different engines, then in hand, attracted our attention by their extreme accuracy and beauty of finish. Some of Whitworth's cutting-machinery was in operation, and presented a remarkable contrast with the slow chisel-process formerly pursued. In these machines, the cutting edge is formed at the extremity of an arm which turns upon a centre, and which is furnished with the graduated arc of a circle to determine its position. The work is laid upon a metal slab, the level of which can be varied by a choice of grooves, as also can be that of the centre of the cutter. The impulse of the machine does the rest; so that a cylindrical curve of any form can be cut out with great ease and accuracy. Self-acting screw-cutters abound in this room, furnished with full sets of "changes," for

varying the pitch of the screw. As broad-gauge engines are manufactured here, all their minute parts partake of the greater magnitude which belong to the engines themselves. The ordinary class of locomotives on this line have cylinders 18 inches in diameter, and 24 inches stroke. Their driving-wheels are 8 feet in diameter, and their bearing-wheels, of which they have two pairs, 4 feet 6 inches. Their total length is 24 feet, of which the interval between the centres of the bearing-wheels, occupies 16 feet. Without its supply of fuel, and the water for its boiler, the engine alone weighs 28½ tons, the tender alone 10 tons, and the weight of both, when loaded, about 56 tons. And this enormous load is frequently urged along the road at rates exceeding sixty miles per hour.

The boiler and fire-box department is one of the most interesting partions of the entire establishment, as might be supposed, when it is remembered that a boiler of a Great Western engine presents 1,750 square feet of heating surface. Here the plates of copper and iron are cut, punched, and riveted; and the long screws of inch copper rod, for screwing through the casing into the fire-box, to prevent expansion outwards, are cut in one machine, and inserted by another; the box and its casing resting on a moveable bed, themselves also moveable upon it, to bring each part of the work successively under operation.

The foundry is necessarily of limited dimensions; as castings are few which occur in the locomotive engine. There, however, we see the cylinders cast, with their slide-boxes; and one which was shown to us scarcely cold, struck us as being one of the finest specimens of the interesting art of the founder we had ever seen.

The only remaining part of the works which we propose to notice at this time, is the engine shed. This is entered by a double line siding from the main line, which brings the engines up to a vast lateral extension of the building on the right. When abreast of this wing, the engines have moved from the permanent way on to the top of a huge moveable platform, the upper surface of which is furnished with several pairs of rails, coinciding in gauge and level with those of the permanent way. When resting upon this platform, the latter is moved slowly into the wing by turning a winch, which stands upon it. The platform moves in a deep trench built up with masonry, upon four wide rails, the two extreme ones of which are cogged to impart the motion to it readily, and over these roll sets of large wheels of corresponding figure, arranged in parallel rows. On either side of the trench are pairs of rails, still parallel to the siding, upon any of which an engine may be pushed, or from which it may as readily be removed by an inverse process. This place affords accommodation, with another communicating chamber of large dimensions, for about a hundred engines, and about seventy were actually laid up. There we found that magnificent machine, "the Lord of the Isles," which attracted so much admiration at the Exhibition, though the repairs she needed were merely nominal. The injury she sustained in the collision at Aynho, on the opening of the Oxford and Birmingham line, appears to have been greatly exaggerated. She was repaired, and running to and from London every day, within a very few days of that unfortunate occurrence.

We now take leave of this subject, of which we have pretended merely to give a sketchy outline, fully satisfied that the extensive application of the art of working in iron, which is here seen in its present perfection, cannot be regarded otherwise than with extreme interest by the general body of our readers.

APPLICATION OF THE PROCESS OF *DEPLACEMENT* IN MANUFACTURES.—PART III.

BY A PRACTICAL CHEMIST.

In the operations of the tan-yard, the *déplacement* system would be found of the greatest utility. The substances employed by the tanner are all costly. Oak bark, by far the best of them, is so difficult to obtain in sufficient quantity, that a variety of substances have been substituted for it. Valonia, divi-divi, cutch, terra-japonica, or catechu, and many others, have been, and are still used, in very many instances, greatly to the detriment of the manufactured article. The old mode of tanning was very effectual. The hides and the bark were laid together in alternate layers in the pit, which was then filled with water. In this way, as the bark yielded the tanning principle to the menstruum, water, the hide was present at once to absorb it. When this action had gone on until the bark had become exhausted, the operation was repeated again and again, until the hide was fully tanned. The great objection to this method was the very long time it required; the thickest hides sometimes being under treatment for three and even four years.

In the present age of small profits and quick returns this objection is fatal; and in order to meet all the requirements of altered circumstances, a great variety of expedients have been resorted to. The chemist and the engineer have both applied the means at their command, and frequently with a great measure of success, to expedite the process, and to economize the material, but very frequently with a sensible deterioration of quality. It appears to be admitted generally, that the conversion of a raw hide into good leather must be a gradual proceeding.

If we make a strong solution of tan, and submit a hide to its action, the gelatine at the surface of the hide will become almost immediately tanned; but there the process will cease. The tanned surfaces will protect the inner portions, and the hide will remain raw in the middle. In order to avoid this consequence, it is usual to begin with weak solutions, and gradually to increase their strength as the operation advances. Many arrangements have been made to facilitate and regulate this process, some of them of considerable merit.

It is not, however, with this portion of the art that we mean to deal, but have thought it necessary to give a brief sketch of the circumstances in which this manufacture is placed, in order to make ourselves intelligible in the treatment of our subject, which it will be seen is inseparably connected with the fundamental principles upon which the economical application of this art depends, under whatever system of manipulation it may be conducted.

We have stated, in our enumeration of certain articles as tanning materials, that oak-bark (perhaps the first employed), is the best, and that the inadequacy of the supply of this article has obliged the manufacturer to seek for analogous vegetable products, in order to substitute them in its place. This has been done to a considerable extent, but somehow or other the result has not been so satisfactory as could be desired.

Whether from an original inaptness on the part of such materials, from an ignorance of the management to which they should be subjected, or from whatever other cause, the resulting product has not yet attained the estimation readily accorded to the old-fashioned bark-tanned leather. In this case, there are none of the usual prejudices which sometimes are obstructive to changes, simply because they are changes. The article is unmistakably inferior, and we believe that all consumers are more or less aware of the fact. We have no intention of pointing to any mode of increasing the supply of oak-bark, but we shall be doing practically the same thing if we show how the quantity now obtainable can be made to do an increased quantity of work.

This can be effected by any arrangement which shall place at the command of the manufacturer all the principles of the material upon which his proceedings depend. Even under the old system, in which time was no element of cost, a great waste of material was the consequence. In the present, the haste of the process has greatly increased that waste. Let the tanner apply the displacing principle, and its economy will soon become apparent.

There are few tan-yards in which this application would be either difficult or expensive. The essential conditions are that the bark should be sufficiently broken down, passed through a mesh or sieve of sufficient firmness—say sixty-four apertures to the square inch—and then subjected to the displacing action of boiling water, until the runnings exhibit little or no trace of tannin, when tested with a solution of sulphate of iron. The residue will be composed of inert woody fibre, and is of no further value to the tanner; but he has in solution all that he requires, and if he judiciously applies it, his bark will have done all it can do, in many cases from 50 to 100 per cent. more than it now does. What we have said of bark is pretty generally applicable to its substitutes, as to their treatment by the tanner. He cannot be sure that he has all he requires, unless he knows that the rejected residue contains no portion of it.

To describe the various functions of the principle of *déplacement* in the pharmaceutist's laboratory would require a volume. In every case in which

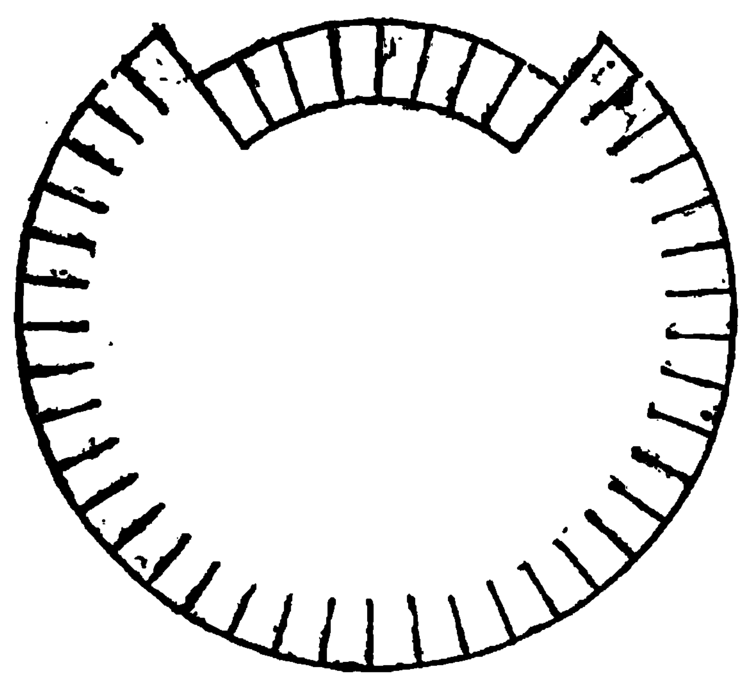
a tincture or infusion is required, it will be found unequalled. Of course, we suppose that the parties to whom these establishments are intrusted need not be told that in the variety of materials upon which they have to operate, the peculiar habitudes of each must be studied. The several menstrua must be adapted to their several purposes, the temperature must be another consideration—in some cases of great importance—but in no cases of what is understood by the term "maceration," is time at all necessary, beyond what the laws of affinity and gravitation must of necessity impose. In the case of resinous solutions—digestion—the same form of apparatus is extremely useful; but here it becomes percolation, and in order to avoid the agglutination which resins are apt to form in fluid menstrua, the old varnish-makers' practice of admixture with broken glass, sand, &c., is essential.

There is one condition which must be kept in mind—the apparatus must in all cases be cylindrical. The inventor began with an inverted cone, but his sagacity at once detected his error, and he has demonstrated both by theory and practice, that the cylinder, and the cylinder alone, can perform the operation of *déplacement* satisfactorily.

The application of the process of *déplacement* to other operations of a congenial kind, will by this time be abundantly obvious. The dyer can apply it in several cases in the production of his colouring-matter with the greatest economy. Of course, we need not say that it is at all fitted for the immediate purpose of dyeing; but in the separation of the colouring principle, in a state of sufficient concentration, from the dense woody structure to which nature has, for the most part, consigned it, it is highly effective. In the very desirable, and often in the coarse processes of manufacture, unattainable objects of obtaining these principles from their natural depository without change, either from the decomposing power of high temperatures, or from long exposure to atmospheric influence, *déplacement* presents the means of defence against both agencies, while it gives to the operator a controul over every gradation of intensity or depth, before his goods are subjected to the bath—a matter in many instances of first-rate importance.

It will be found no less fitted for the purpose of digestion—varnish-making, for example;—because, as we have shown, we can make the process slow or quick by the controlling power of the stop-cock, through which all products must pass, while the lid affords a perfect preventive of loss by evaporation, as we have before said, by the simple resource of luting it in its place.

In some operations of this class, the preparation of solutions of perfect and permanent transparency, it will be found of advantage to cover the perforated metal diaphragms with bibulous paper. As this form of filter is peculiar to the apparatus, we here introduce a figure, showing a disc of such paper, cut and partially folded; so that, when applied upon the perforated metal plate, it may entirely cover it, and by the radiated divisions of its edge, be capable of a cupped adaptation to the vertical sides of the circumscribing cylinder.



No more need be said on the subject but this, that where permanence of transparency is wished, accompanied by saturation, the percolation must be conducted at a lower temperature than it is probable the product may be at any aftertime exposed to.

THE IRON TRADE.

Birmingham.—Rumours of a reduction in the price of iron have been prevalent during the week, but up to the present time there has not been any official announcement of a reduction from any of the large

houses who subscribed to the quotations of quarter-day. The market is still reported firm, but a continuance of the present prices, known, as they are, to be incompatible with the manufacturing interest, is held to be impossible. With regard to the injury which our manufacturers are sustaining in the American market, the intelligence received here by the last arrival from the United States supplies unquestionable evidence of the serious consequences likely to result to the ironmasters themselves from what is now held to be their shortsighted policy of running up the price of iron beyond the point which continental competition would justify. Letters have been received from Philadelphia and Boston, detailing the extraordinary impetus which mining operations have received in those places, in consequence of the great advance in the price of iron in this country. It appears that new furnaces, mills, &c., have been erected, old ones restored, and thousands of hands have been set on to make iron, which, at moderate prices, they would have been quite willing to have purchased in this country. And not only have they set on the works, but they have entered into large contracts for supplying railway companies from whom we had reason to anticipate extensive orders. Therefore, considering the thousands of miles of railway projected through the United States, and which will be laid down within the next few years, it is a question of vital importance to the manufacturers of this country, whether the rails are to be made here or there, and the sooner that question is solved, the better.

South Staffordshire.—The iron trade of South Staffordshire may be described as unsteady, at comparatively high prices. Objections have been made by parties interested in the maintenance of high prices of iron to the reduction announced. Bars which, at the quarterly meetings, were quoted and settled at 12*l.* per ton, were, within a week afterwards, offered to be delivered in Liverpool at 10*l.* 10s. There is no question that sales were made to a considerable extent at the highest figures yet published, but it is equally unquestionable that, since that period, prices, even of the best make, with some makers have fallen, and at the present moment have a downward rather than an upward tendency. It is a result which has been long anticipated, and, from the best information we have been able to obtain, we are inclined to think that the present high rates cannot be much longer firmly maintained.

Glasgow Pig Iron-market,—Glasgow, Jan. 29.—We have had a fair business during this week. On Monday, by a strenuous effort on the part of certain southern operators, the price of warrants was forced up to 65s. cash, at and under which rate large parcels were sold here and in Liverpool; the move, however, was not supported, sales being made the same afternoon at 61s. 6d., and since we have had a quiet market, the price ruling about 61s., at which we closed to-day sellers, buyers offering 60s. 6d.

THE TRADES OF BIRMINGHAM.

The embarrassment of the manufacturers of brass, copper, and tin articles still continues, and their condition cannot be better elucidated than by the following quotation from a circular issued on Saturday evening, by a highly respectable firm in the trade:—"Owing to the unsettled state of the copper market, and present high price of all metals, we are compelled to cancel all previous quotations and discounts; assuring you that all orders entrusted to us will be executed, under the circumstances, on the best possible terms."

A Company, under the denomination of the "Rheidol United Mines Company," has been recently established, consisting of sixteen proprietors, for the purpose of working the silver lead mines in Wales, which constitute their property; but it is not improbable a few shares may be allotted to the public. At a meeting held a few days ago, at the office of the purser and secretary, Mr. Phillipps, Bennett's-hill, satisfactory intelligence was read from the miners, from which it appears that they have intersected the lode, or a flyer from it, in the top level Rhudhyyas, and that it contains a mixture of lead ore, black jack, and sulphur, and all other indications calculated, it is said, to render the undertaking a profitable speculation.

The general trade of the town is still good, but the high prices of the various metals will, ere long, materially affect it.

The Birmingham papers still continue numerous advertisements for workmen in the leading branches, including cabinet-case makers, tin-plate workers, moulders, iron-casters, fender-fitters, railway lamp and lantern-makers, jewellers, &c.

The injurious effect of the high price of copper upon local manufactures can scarcely be conceived. Mr. Muntz, M.P., at his sheathing-works, at Smethwick, consumes somewhere about 50 tons per week, and the rise during the last eight weeks of 20s. or 30s. per ton, it may be imagined, must make a serious difference in any previous contracts into which he may have entered. It is not, however, every manufacturer who is so well prepared to contend with the present emergency. The manufacturers

and brassfounders of Birmingham participate in the exactions forced upon them by the Cornish and other producers of copper.

The gun and pistol trade of Birmingham continues to be most animated. Makers cannot supply pistols, more especially revolvers, fast enough. They are generally destined for the Australian and Californian markets.

The nail trade is again very brisk. We have heard of one contract for 40 tons.

Copper tubing, notwithstanding the drawback of price, is active, and many new inventions are announced. Among the most useful is one by Mr. Martin Billing, of metal cornices, poles, rings, picture-rods, &c., manufactured upon a new principle. The advantages claimed for these productions are of various kinds. The poles made in the ordinary way are entirely of brass tubing. Those in question are lined with zinc, the mandril rolling to which they are subjected hardening the outer surface, and improving the appearance. The ring and rods are constructed in a similar manner. They are far superior in appearance and durability to those hitherto prevalent, and are in great demand.

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Simpson, Esq., Vice-President, in the chair, when the Paper read was "On the Pneumatics of Mines," by Mr. Joshua Richardson, M. Inst. C.E.

The author, after showing and lamenting the discrepancy existing among the various systems of ventilation, which might be traced to the want of good formulæ for the necessary calculations, strengthened his position by the evidence given in the Reports of the Parliamentary Committees, and of that at South Shields, in 1843. He then explained the usual modes of calculation, and demonstrated, that many more points required to be considered than were ordinarily admitted to bear on the question, and that no sound basis of calculation could be formed on any one of the various elements, but that the whole must be carefully considered, after having examined each element in detail.

The chemical constitution and properties of atmospheric air were then considered, its uses in the animal economy, its adulteration by deleterious gases, and the compensating action provided by nature, for restoring it to its primitive purity.

The principles of combustion were then defined, and calculations were given, for determining the amount of atmospheric air required for supporting combustion and animal respiration; and for compensating for the amount of deterioration by perspiration. The several quantities of air practically required in mines, for the healthful support of men and horses, were carefully shown, with the modes of calculating; allowing for the distance the air must travel.

Then followed the analysis of the deleterious gases existing in mines; the fire-damp, choke-damp, and after-damp,—with the quantity of atmospheric air required to dilute these vapours, so as to render them innocuous, or to promote such ample ventilation as to sweep them away from the galleries of the mines.

A clear description was then given of the "Eudiometer," and of the method of using it, to discover the quantity of oxygen, and the per centage of carburetted hydrogen, or other gases, contained in the air of any part of a mine. The solution of chlorine in water, determining the quantity of hydro-carbonate, or fire-damp present; that of green sulphate of iron, impregnated with nitrous gas, the relative quantity of oxygen, and that of lime-water (or better, caustic potassa, or baryta), the relative admixture of carbonic acid.

The absolute necessity foı diluting the fire-damp with, at least, thirty times its volume of atmospheric air, and forcing it out of the mine with rapidity, was insisted on, and examples given of explosions occurring apparently from the most opposite causes; still, however, traceable to the same source—a deficiency of ventilation.

The diagram of Dr. Clanny's clever analysis of fire-damp was then given and reasoned on; and the precautions to be observed on entering a mine, after an explosion, were detailed at length, as more men were, generally, killed by the after-damp, than by the explosion itself.

The calculations were then given for determining, from the previous data, the quantity of air actually required in mines, taking into consideration the number of men, horses, and lights, the presence of deleterious gases, the increased temperature, the difference of barometric pressure, and the length of the galleries through which the air coursed.

The results were shown in tabular forms, and simple rules were deduced for determining the quantities required, under all circumstances of varying per centage of deleterious gases, &c.

The amount given by these rules might appear large, but when compared with the tabular statement of the quantity of air actually passing through twenty-four of the principal mines of Great Britain, it

was shown to be below that allowed for the best, and even those had not been entirely free from accidental explosions.

The results of the investigation appeared to demonstrate the possibility of determining the quantity of air required in mines, under all circumstances, basing the calculations on the premises demonstrated in the introduction, and using the simple rules, whose results corresponded, in a remarkable degree, with the best practical observations; and a hope was expressed that the great simplicity and applicability of the rules would recommend them to notice and experiment, until time, by establishing their trustworthiness, should induce their general adoption.

The discussion of the Paper was adjourned, until the meeting of Tuesday, February 8, when the whole evening would be devoted to the subject.

SOCIETY OF ARTS.

The ninth ordinary meeting of the Society of Arts for the present session was held on Wednesday last, Sir Charles Pasley in the chair.

Mr. Wilkinson read an elaborate and highly interesting paper on the rifle, and its effective employment in warfare. He commenced by giving a brief history of the musket, its various deficiencies in times past, and especially during the late war, when a French military engineer calculated, that such was the crude manner in which the weapon was manufactured, that in battle, including even the artillery, not more than one ball in every 10,000 wounded or killed. He next alluded to the Minié rifle, and observed that the credit of its invention was not due to Capt. Minié, but a Frenchman named Devenant. All that M. Minié had to do with it was to give a concavity to the bottom of the barrel, into which the ball fell. This, it appeared, had the effect of adding to the accuracy of the rifle. Mr. Wilkinson then explained some improvements which he suggested, especially an instrument for readily measuring the distance in yards an object was removed from the person going to fire, and produced several examples of his cylinder, conical, and self-rifling balls.

On the motion of Colonel Thornton, a vote of thanks was unanimously passed to him for the very interesting manner in which he introduced his subject.

Mr. Winiwarter next briefly explained a new invention by him of a paste, or composition powder, which he recommended instead of the percussion caps now in use; more especially as this paste did not, like gunpowder, leave any residue behind it.

The thanks of the Society were voted to Mr. Wilkinson and also to Mr. Winiwarter; after which the proceedings terminated.

Statistics of American Railways.—A very valuable report appended to the American census returns furnishes some interesting statistics respecting the railroads of the United States—from which we deduce the following facts:—At the commencement of 1852 there were 10,814 miles of railroad completed and in use, and 10,898 miles in course of construction. About 1,200 miles of new railroad have been completed during the past year, and about 2,000 miles of new road placed under contract, so that the railroads completed on the 1st of December would be 12,014 miles, and those in progress are increased to 12,898 miles. The total amount invested in railroads made and projecting is set down at 672,770,000 dollars. The average rates of fares on the railroads are less than 1d. a mile.

Mechanics' Institutes and the Aristocracy.—The interest evinced by various members of the aristocracy in the proceedings and in the prosperity of mechanics' institutes, so gracefully displayed in particular by Lord John Russell at Leeds, has just received another illustration. In the programme of lectures for the second session of the winter 1852-3, of the Devonport Mechanics' Institute, and of the Stonehouse Literary and Scientific Institution, stands the name of the Right Hon. Henry Tufnell, M.P., for a lecture. At Devonport the lecture is to be on a subject to be announced to the members previously in a syllabus of the lecture, which is to be circulated amongst the members. At Stonehouse, "Eastern Travel and Superstition" has been announced. Mr. Tufnell is a life-member of the Devonport Institution.

The Electric Telegraph in America.—A great deal of social correspondence goes on by means of the American Telegraph. It often happens that two persons wish to "converse" when 500 miles asunder; an hour is appointed for them to meet in the respective offices, where they interchange communications through the medium of the operator. On one occasion a steam-boat was sold over the wires, the seller being at Pittsburg and the buyer at Cincinnati; each party wrote down what he had to say; they higgled awhile, and at length concluded the purchase. On another occasion, the family of the proprietor of Astor Hotel, at New York, held a friendly telegraphic meeting with the family of the proprietor of Burnet

Hotel, at Cincinnati, distant 750 miles. They assembled in the respective offices of the telegraph companies in the two cities, they talked over family matters, interchanged congratulations, and drank each other's healths. The operators at Philadelphia and Pittsburgh (two intermediate cities on the line) finding what was going on, begged to join in the harmony; wine was ordered from two hotels in those cities, to be sent to the respective offices, at the request of the hotel-keepers at the other cities, and thus all four cities took wine with each other.—*Electric Telegraphs, in Companion to British Almanack for* 1853.

THE SECOND TRIAL TRIP OF THE "ERICSSON."

The *New York Herald* of the 12th ult. gives the following particulars of the second trial trip of the *Ericsson:*

The distance from Governor's Island to her turning-point and back was about 18 miles, which was accomplished in 2¼ hours. The greatest number of revolutions made on the trip was 10½, and the greatest speed attained was nine miles an hour. This trip was not made to show her speed, but to convince the public that the parties interested in her have succeeded in their promise of proving the capability of a vessel being propelled by caloric. On the way back, the party assembled in the saloon, when Captain Ericsson explained, by the aid of a diagram, the whole principle and method of working his caloric engines. He gave a succinct history of the whole matter, and demonstrated the method by which the atmosphere was drawn in cold, then forced through a wire network, forming a surface of 15,000 square inches, into a lower cylinder, where, receiving additional heat from the furnace, it expanded in the larger cylinder so as to raise it, and then escaped through the gauze into the open air, having imparted the greater portion of its heat to the wirework, which was again absorbed by the fresh draught of cold air passing through the same wire meshes to be heated. The pressure was uniformly 12 lb. to the square inch. Captain Ericsson estimated the force of his machinery at 600-horse power. The upper cylinder in each case contained a head surface of 14,000 square inches, and the lower cylinders a surface of 22,500 square inches. The diameters of the main cylinders were about 168 inches. The main valves were about 2 feet in diameter. The consumption of coal was at the rate of about 6 tons in 24 hours. During Captain Ericsson's lucid exposition of his machinery, he invited the most rigid scrutiny and investigation. The expense of running a caloric engine, he stated, would be but one-fifth of that of a steam-engine of the same power.

All that is necessary to gain additional power is to increase the diameter of the cylinders. Those in the present ship, it is clear, are too small to give the power and speed that are desirable. Captain Ericsson said he foresaw this difficulty, but was told by ironfounders that they could not cast the cylinder of greater dimensions than 14 feet. Since these were made that size and put into this ship, a firm in New York had offered to guarantee to cast them of 20 feet in diameter. Captain Ericsson estimates, that were the present ship's cylinders of 16 feet diameter, she would make a speed equal to the best ocean steamers, or 12 or 14 miles per hour; and that a vessel with 20-feet cylinders would outstrip the speed of anything that now floats on the water. Captain Ericsson thinks his invention can be modified to propel locomotives on railroads, and applied to nearly all kinds of stationary work, great and small. A locomotive on this plan could be made to traverse a street, without stopping for water or fuel on the way.

New Strategies in Warfare; with Economy of Life and Money in National Defence. By John Macintosh, C.E. Effingham Wilson.

Under the title of "Strategies in Warfare," the author of this important little volume describes four or five inventions which he has spent much time in perfecting, and for the practical efficiency of which he has the sanction of actual experience resulting from trial. A few introductory pages are devoted to considering, in point of morality, the employment of human intellect in increasing the means and devastating power of war; and we fully agree with him, in common with all rational men who look philosophically on the present social organization of mankind, that the best preventive for the horrors and brutalising influence of war, with its retrogressive tendencies—the best Peace Society we can have—is to render its weapons the most destructive, and its tactics the most certain and easy. We may be sure that the fighting profession will be less eager to precipi-

tate international animosities, when it is universally understood that a recourse to arms must inevitably result in internecine annihilation.

The pressure on our pages obliges us on the present occasion merely to indicate the heads of Mr. Macintosh's invention, promising to return to the subject in our next, when we propose describing it in detail.

First, in fire-arms, Mr. Macintosh has provided a "self-plugging lateral explosion shell." When an ordinary exploding-shell is fired into a mass of timber, the explosion takes place through the aperture by which the shell entered, not unfrequently releasing the shell altogether without any considerable damage. Considering this circumstance, Mr. Macintosh has contrived a new shell, which consists of a concave spindle of malleable iron, surrounded with a casing of lead. A bursting charge occupies the space between the spindle and the case, which is ignited by a fuse leading to a percussion-cap at the apex of the cone. By this arrangement a lateral explosion necessarily takes place, which is wholly effective. Another part of the author's invention is a "repeating" arrangement, whereby a succession of shots are fired at the same charge, priming, and adjustment. This is effected by a simple disposition of internal fuses, which we shall particularly explain in our next, as also a mode of projecting shot under water, in close action.

A further contrivance, remarkable at least for its extreme simplicity, is called by the author a "Wave Repressor." Its introduction is founded upon an observation of the effect of fields of floating ice,—extensive masses of sea-weeds, and even spilt oil, in producing calm water inside them; and it consists merely of a large flexible and buoyant surface, made in pieces, which are united, and the whole laid upon the sea, and anchored underneath by grappling chains. Within the spaces of smooth water thus made, the author proposes to employ our hulks as batteries. The manner of his doing so we shall explain in our next.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING FEBRUARY 3, 1853.

Emery Rider, of Bradford, Wilts, manufacturer. *For improvements in the manufacture or treatment of India-rubber and gutta percha, and in the application thereof.* (Partly a communication.) Patent dated July 20, 1852.

This invention relates exclusively to the treatment of gutta percha in order to enable it to be submitted to the process of vulcanisation, by which it acquires new properties, becoming permanently elastic and fitted for uses to which in any of its prepared states it has been hitherto inapplicable. The new mode of treatment consists in subjecting the gutta percha, after it has been cleansed from the fibrous matters usually found in admixture with it, to the action of heat, in order to expel the watery, oleaginous, and other volatilizable matters contained in it, and render it susceptible of becoming cured or vulcanized when exposed to the action of heat in contact with sulphur or compounds thereof. The heat in the preliminary process need rarely exceed 400° to 500° Fahr., and in some cases will not require to be more than 300°; all that is requisite being to expel the volatilizable matters and bring the gutta percha to a doughy consistence. The materials which are used by preference in the vulcanizing operation are the hyposulphites of lead or zinc, and that process is performed in the same manner as when caoutchouc is being operated on.

Claims. — 1. The preparation of gutta percha by a preliminary heating to such a degree that the volatile and oleaginous fluids or ingredients contained therein in its raw state are expelled, whereby it may be subjected to the same treatment that caoutchouc receives when being cured or vulcanized and the same valuable results produced.

2. The production from gutta percha of a new material permanently elastic, not liable to be affected by change or degree of temperature, and applicable to all the important purposes for which caoutchouc alone has been heretofore used, as well as being much more valuable for the many purposes to which gutta percha is at present applied.

John Francis Egan, of Covent-garden. *For improvements in the manufacture of sugar.* (A communication.) Patent dated July 20, 1852.

The *first* part of this invention has relation to the arrangement and working of the boiling pans. These the patentee disposes in sets and heats in the usual manner, but instead of raking the scum from each pan to the next in succession, and so on throughout the series, he rakes it from each pan into gutters or troughs, and passes the accumulated quantity to the last in the range, where it is subjected with the matter contained in that pan, to the boiling process in the ordinary manner.

The *second* part of the invention relates to the defecation of cane juice, and consists in employing for that purpose a mixture

composed of plantain-juice and quick lime, in the proportion of 7 lbs. of the latter to 10 gallons of the former, with the further addition, before using the compound, of 1 oz. of flour of sulphur to every 6 gallons. Two or three quarts of this mixture are to be added to the boiling juice after the first scum has been thrown up and removed. The effect will be to cause the principal portions of the impurities held in suspension to rise into thick scum, leaving the sugar solution bright and clear.

JOSEPH WILLIAM SCHLESINGER, of Brixton, Surrey, gentleman. *For improvements in firearms, in cartridges, and in the manufacture of powder.* Patent dated July 20, 1852.

Mr. Schlesinger describes and claims,

1. An improved needle-gun; a full description of which, with engravings, will be found at another part of the present Number (*ante* p. 101).

2. Certain improvements in cartridges.

3. Certain improvements in the manufacture of powder.

GEORGE AUGUSTUS HUDDART, of Brynkir, Caernarvon, Esq. *For improvements in the manufacture of cigars.* Patent dated July 20, 1852.

The *first* improvement described by Mr. Huddart consists in drilling a hole in the butt-end of cigars, in a line with the axis and to any required depth, for the purpose of enabling the smoke to pass more readily to the mouth of the smoker. An arrangement of machinery for performing this drilling operation is described, in which the hole is perforated by means of a revolving hollow drill, the cut tobacco-dust being drawn away through the hollow of the drill by means of an exhausting apparatus, which is worked by the same treadle-movement that gives rotation to the perforating drill. In order to prevent the valves of the pneumatic apparatus being choked by the particles of tobacco removed from the centre of the cigar, the blast of air which exhausts them from the drill is caused to pass through a closed vessel containing water, which intercepts the tobacco-dust but allows the air to pass freely.

The *second* improvement consists in lining the holes drilled in cigars with tubes of amber, gutta percha, or other water-proof material, which are cemented to the exterior of the cigars at their ends at the time of being introduced, by causing them to pass through a chamber containing a liquid cement composed of the same material as the tubes themselves; or the same cement may be applied to the interior of the holes drilled in cigars, by means of a camel's-hair pencil, which arrangement will be found to answer the same purpose, in many cases, as the use of the tubes.

Claims. — 1. Drilling the butt-ends of cigars, for the purpose set forth.

2. The arrangement of machinery for performing the drilling operation.

3. Lining the drilled ends of cigars with a waterproof substance.

4. The means of simultaneously inserting and cementing tubes into cigars.

RICHARD BEALEY, of Radcliffe, Lancaster, bleacher. *For certain improvements in apparatus used in bleaching.* Patent dated July 20, 1852.

These improvements apply to the mode of heating the keirs or vats used in bleaching yarns and goods, which is generally effected by admitting steam under the false bottom of the kier until a sufficient temperature has been obtained.

Mr. Bealey now proposes to heat the liquid by steam in a separate vessel in communication with the keir, and to allow it to pass, when heated, into the keir from above, displacing the cold liquid, and driving a portion of it into the heating vessel, from which, when heated, it will again pass into the keir.

Claim.—The application of steam to a vessel or pipe outside the keir for the purpose of heating the liquid.

JAMES M'HENRY, of Liverpool, merchant. *For certain improvements in machinery for manufacturing bricks and tiles.* (A communication.) Patent dated July 20, 1852.

The *first* improvement described by Mr. M'Henry in manufacturing bricks, &c., consists in drying the clay preparatory to moulding, in a kiln where it is received into the troughs, each fitted with a screw, by which the clay is passed through the kiln, and every part of it exposed to the equal action of the fire at the same time that it is partially kneaded.

The *second* improvement consists in placing the rollers used for crushing and grinding clay in an inclined position, in order to facilitate the passing away of stones, &c. In other respects, the machinery does not differ from that commonly used.

The *third* improvement consists of an arrangement of cylindrical screen, having internal arms or beaters for screening clay.

The *fourth* improvement consists of an arrangement for moulding clay into bricks, &c., by consolidating it in the moulds under the pressure of rollers.

The *fifth* improvement consists in making the moulds of such machines removable; and

The *last* improvement is an improved form of kiln for baking bricks, tiles, &c.

JOHN KIRKHAM, of the New Road, civil engineer, and THOMAS NESHAM KIRKHAM, of Fulham, civil engineer. *For improvements in the manufacture of gas for lighting and heating.* Patent dated July 22, 1852.

The *first* branch of the present improvement consists in manufacturing gas from water by decomposing it in contact with incandescent coal in suitably-arranged retorts. The quality of the gas thus produced may be improved by passing it through heated retorts, and then through other retorts containing cannel coal, undergoing the process of distillation.

The *second* branch of the invention consists in purifying coal gas by the employment of the subchloride or oxichloride of antimony, which material may be obtained by boiling sulphuret of antimony or common antimony ore in muriatic acid, and then washing it. The material may be used either in the wet or dry state, in the same manner as practised in lime purification.

PROVISIONAL PROTECTIONS.

Dated January 6, 1853.

40. William Beales. An improved cement for the resistance of fire.

Dated January 7, 1853.

46. William Charles Scott. Improvements in wheels.

Dated January 8, 1853.

59. Francis Parker and William Dicks. Improvements in boots, shoes, and that kind of spatterdashes termed antigropelos.

Dated January 11, 1853.

69. Joseph Beattie. Certain improvements for economizing fuel in the generation and treating of steam.

71. Henry Constantine Jennings. Improvements in separating the more fluid parts of fatty and oily matters.

73. Joseph Robert Wilkin Atkinson. Improvements in machinery for preparing and spinning flax, tow, and other fibrous substances.

75. John Petrie, junior, and Samuel Taylor. Improvements in machinery or apparatus for washing or scouring wool.

Dated January 12, 1853.

77. John McDowall. Improvements in cutting or reducing wood and other substances.

79. John Hick. Certain improvements in the method of lubricating revolving shafts and their bearings or pedestals.

80. James Fletcher. Certain improvements in machinery applicable to spinning, doubling, and winding of cotton, wool, flax, silk, and other fibrous materials.

81. William Bryer Nation and Joseph Dyer. An improvement or improvements in the manufacture of soap.

83. George Augustus Huddart. Improvements in the manufacture of artificial leather.

85. William Nairne. Improvements in reeling yarns or threads.

86. Edward Haslewood. Improvements in firearms and projectiles. A communication.

87. John Capper and Thomas John Watson. Improvements in preparing and bleaching jute and other vegetable fibres.

89. John Bennett and Henry Charlesworth. Improvements in doffing and preparing rovings of wool.

Dated January 13, 1853.

90. Moses Cartwright. An improvement or improvements in the preparation or manufacture of gypsum or plaster of Paris.

92. William Brown. An improved method of treating coal and bituminous substances, and for improvements in the treatment of their volatile products.

93. John Rumley. Certain improvements in pumps.

94. Edward Wills Uren. The manufacture of bricks, pipes, tiles, imitation stone, and peat bricks for fuel, by the means of a machine and arrangements of machinery titled a central circular and horizontal motion.

95. George Fife. Improvements in protecting vessels and exposed surfaces from injury or decay.

96. John Walker Wilkins. Improvements in electric telegraphs, and in the instruments used in connection therewith.

Dated January 14, 1853.

97. Joseph Lillie. Improvements in machinery to be used in the process of malting, drying, and seasoning grain, including certain vegetable and other substances.

98. Richard Taylor and Hezekiah Henry Salt. Improvements in the manufacture of spoons and ladles.

99. Arthur James. Improvements in means of enclosing needles.

100. John Henry Vries. Improvements in obtaining motive power.

101. William Steads. Improvements in blinds, maps, charts, and other articles wound on rollers.

102. Frederick Joseph Bramwell and Isham Baggs. Improvements in steam machinery used for driving piles, hammering, stamping, and crushing.

Dated January 15, 1853.

103. James Stewart Kincaid. Improvements in ascertaining and registering the number of persons entering or quitting omnibuses or other vehicles or vessels, which improvements are applicable, in whole or in part, to buildings or other places.

105. Edward Tasker. An invention for the purposes of writing and drawing, called "The Writing and Drawing Tube."

107. James Hadden Young. Improvements in brooms for brushing apparatus.

108. Peter Alexander Halkett. An improved construction of inkstand.

109. John Arrowsmith. Certain new or improved pumping machinery.

Dated January 17, 1853.

110. Thomas Potts and James Septimus Cockings. Improvements in the manufacture of tubes, and in the application of tubes to certain purposes.

111. Thomas Cropper Ryley and Edward Evans. Certain improvements in the construction of wrought-iron wheels, to be used upon railways or for other purposes, and in the machinery or apparatus connected therewith.

112. Alexander Yorston. Improvements in the construction and arrangements of parts of railways.

113. William Nairne. Improvements in power looms.

114. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of "batting" or "wadding." A communication.

115. Auguste Loradoux Bellford. Improvements in the manufacture of blocks for printing music. A communication.

117. Henry Henson Henson and William Frederick Henson. Improvements in signalizing on railways, and in the apparatus used therein.

118. Auguste Edouard Loradoux Bellford. An

improved machine for obtaining motive power. A communication.

Dated January 18, 1853.

119. Christopher Binks. Improvements in producing electric light.

120. John Thornborrow Manifold and Charles Spencer Lowndes. Improvements in steam engines.

121. Henry Browning. Improvements in preparing compositions for coating iron, and other ships' bottoms, and other surfaces.

123. Orlando Reeves. Improvements in the manufacture of manure.

124. Alfred Vincent Newton. An improved sewing machine. A communication.

125. Peter Fairbairn and Samuel Renny Mathers. Certain improvements in machinery for drawing the sliver and rove of flax, hemp, and tow.

126. Thomas Lees, Squire Lees, John Lees, and Thomas Lees, junior. Improvements in apparatus for admitting water to boilers.

127. John Sheringham. Certain Improvements in stove-grates.

128. Robert Neale. Improvements in the process of copper and other plate and cylinder printing and inking, and wiping and polishing by machinery the engraved plates and cylinders whilst used in the process.

Dated January 19, 1853.

130. Sydney Smirke. Improvements in apparatus for giving signals on railways.

132. William Francis Snowden. An improved mangle.

134. Thomas Judge. Improvements in propelling vessels.

136. Joseph Maudslay. Improvements in steam engines, which are also applicable, wholly or in part, to pumps and other motive machines.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February* 1*st*, 1853.)

140. Thomas Robson. Improvements in apparatus for igniting signal and other lights.

144. William Seaton. Improvements in the construction of iron vessels, and in sheathing or covering the same.

322. George Gent and Samuel Smith. A fruit-cleaning and dressing machine.

470. William Lukyn the elder. A liquid draught detector, or self-measuring tube, with a union conveyance tap and its stock and time-table.

521. John Cass. Improvements in steam engines.

731. Edward Davy. Improvements in the preparation of flax and hemp.

768. John Wheeley Lea and William Hunt. Improvements in utilizing the waste heat of coke-furnaces.

801. John Trestrail. Improvements in raising sunken vessels or other materials from under the water or in the sea, or to prevent them from sinking.

815. John Wheeley Lea and William Hunt. Improvements in the manufacture of iron.

908. Francis William Ellington. Improvements in the making of screws for collapsible and other vessels.

982. Peter Armand Lecomte de Fontainemoreau. Improvements in constructing the bars of furnaces and grates. A communication.

1079. Sir Francis Charles Knowles. Improvements in the manufacture of iron.

1106. John Clay. Improvements in the manufacture of coal gas.

1118. Ferdinand D'Albert. A certain chemical combination for replacing indigo, which he calls "D'Albert Blue."

7. Joseph Brough. A new manufacture of a vitrified substance, and its application, alone or in combination with mineral, earthy, and plastic substances, to various useful purposes in the arts, and for certain other new applications of known plastic substances.

10. David Hulett. Improvements in the manufacture of ornaments for lamps, chandeliers, and architectural purposes.

22. Gustave Eugene Michel Gérard. Improvements in manufacturing and treating caoutchouc.

31. William Louis Sheringham. Illuminating buoys and beacons in harbours, roadsteads, and rivers.

32. Edward Hutchinson. Certain improvements in the mode or method of preparing, cleaning, drying, and otherwise treating wheat, pulse seeds, and other grain.

40. William Beales. An improved cement for the resistance of fire.

53. Robert Lovely. Certain improvements in the application of steam to the propulsion of carriages on common roads, parts of which improvements are applicable to the construction of carriages for common roads.

73. Joseph Robert Wilkin Atkinson. Improvements in machinery for preparing and spinning flax, tow, and other fibrous substances.

76. John Horrocks. Improvements in indicating and registering the number of passengers conveyed in public carriages.

77. John McDowall. Improvements in cutting or reducing wood and other substances.

79. John Hick. Certain improvements in the method of lubricating revolving shafts and their bearings or pedestals.

85. William Nairne. Improvements in reeling yarns or threads.

86. Edward Haslewood. Improvements in fire-arms and projectiles. A communication.

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123. Orlando Reeves. Improvements in the manufacture of manure.

127. John Sheringham. Certain improvements in stove grates.

130. Sydney Smirke. Improvements in apparatus for giving signals on railways.

145. Georges Edouard Gazagnaire. Improvements in the manufacture of nets for fishing and other purposes. A communication.

182. Warren Fisk Shattuck. A smut-machine. A communication from Leonard Smith.

Opposition can be entered to the granting of a Patent to any of the parties in the

above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

145. George Edouard Gazagnaire. Improvements in the manufacture of nets for fishing and other purposes. A communication. January 20.

182. Warren Fisk Shattuck. A smut-machine. A communication from Leonard Smith. January 25.

184. Thomas Ovans. Improvements in the manufacture of boots. January 25.

WEEKLY LIST OF PATENTS.

Sealed Jan. 29, 1853.

62. John Sayers.
233. William Crook.
378. Preston Lumb.
587. James Rock, junior.
721. Caleb Bloomer.
895. Emile Martin.
915. Samuel Clarke.
932. William Taylor.
962. William Maugham.
991. Thomas Lovell Preston.
1011. Edward Thomas Loseby.
1013. George Collier.
1022. Thomas Boardman.
1031. George Dixon.
1036. Josiah Glasson.
1045. Henry Clayton.
1051. John Webb.

Sealed Feb. 2, 1853.

767. John Ramsbottom.
978. James Smith.
994. Henry Jenkins.
1000. James Lawrence.
1012. Charles Greenway.
1032. Timothy Morris and William Johnson.
1034. John Thomas Way and John Manwaring Paine.
1044. David Napier.
1046. William Henry Fox Talbot.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Jan. 27	3414	J. C. Onions	Birmingham	Extra blast telegraphic wire-welding forge.
28	3415	P. H. De la Motte	Westbourne Grove	Portable camera.
,,	3416	W. Leggatt	Derrythorpe	Ploughshare.
Feb. 1	3417	W. Eassie	Gloucester	Pole and bolster for railway trucks.
,,	3418	Witton, Daw, and Co.	City	Rifle and pistol-sight.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Feb. 1	491	S. C. Kingston	Kensington	Hat mirror.

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MACINTOSH'S PATENT LATERAL-EXPLOSION, SELF-PLUGGING SHELL, AND REPEATING FIRE-ARMS.

Fig. 3.

Fig. 4.

Fig. 2.

Fig. 1.

MACINTOSH'S PATENT LATERAL-EXPLOSION, SELF-PLUGGING SHELL, AND REPEATING FIRE-ARMS.

(Patent dated March 24, 1852. Specification enrolled September 24, 1852.)

In our last Number we called attention to a system of highly effective contrivances, distinguished by great simplicity of construction, which their inventor, Mr. John Macintosh, C.E., has described in a work on the subject just published. We now propose to exhibit the nature of these new arrangements sufficiently in detail to render appreciable their great importance in military operations, and their still greater importance in those which belong to naval tactics; and at the same time to notice the results which they have accomplished, and the variations from present practice which they will certainly occasion.

The substantial part of the invention, estimated according to its practical advantage, has received from its inventor the name of the "lateral explosion and self-plugging shell." In this missile, a simple remedy has been provided for an inherent defect in the arrangement and explosion of the ordinary shell. It is found in practice—and, indeed, the result could scarcely be otherwise—that from the want of a re-acting surface at the aperture made by the shell in entering, the effort of the explosion is almost entirely wasted; producing an amount of damage quite inconsiderable in comparison with the blasting charge employed, and in many instances the shell itself being released from its bed. Of the physical energy of the explosive force, we have, probably, but very imperfect ideas, as observation seems to assign to it a far higher intensity than any other of the natural agencies we see in operation around. Among the numerous phenomena which it presents under different combinations of circumstances, none have been more satisfactorily established than this, that the violence of explosion is proportioned, probably in an increasing ratio, to the force which resists it. Thus a charge, loosely or carelessly confined, might only produce an expansive force equivalent to ten atmospheres, whereas, rigidly confined in all directions, it would be capable of exercising a power equal to 5,000 atmospheres. When rendered fully effective by confinement, a small explosion will produce an amount of destructive work far exceeding that observed in less artificial arrangements. It has been pretty correctly ascertained, that a cubic inch of gunpowder is converted by ignition into 250 cubic inches of *permanent* gases, which, according Dr. Hutton, are increased in volume eight times, at the moment of their formation by the expansive influence of heat. Assuming these data to be true, confined and ignited gunpowder will exert, at least, a force of 2,000 lbs., on every square inch. Robins valued the force developed at 1,000 times the pressure of the atmosphere; Euler, Lombard, and Bernouilli at 10,000; and Count Rumford at 50,000. This great discrepancy of results shows that the experiments upon which they are based were conducted under different circumstances, and the only conclusion we are able to draw is, that the force developed is in proportion to the resistance opposed to expansion, the limit of which is not yet determined. To confine the explosion, therefore, at the moment of its generation, is the true philosophy of effective destruction of this kind, and a short explanation of Mr. Macintosh's shell will serve to show how completely and how elegantly he has complied with this condition.

Fig. 1 is a longitudinal section through the axis of a cylindro-conoidal shell constructed upon Mr. Macintosh's principle. The dark mass of material, which occupies the centre of the shell, and which is lettered E *g* in the figure, represents a spindle, or solid of revolution, generated by the rotation of the dark section about its axis. In the determination of the figure of this section, a few objects are to be kept in view, of which, at present, it is only important to notice this—that it must have large recesses on either side, so as to produce a spacious annulus, or belt, the section of which is indicated by the letter *a*. It must also be provided with two grooves for the reception of an exterior casing, which is of a nature to answer at once two purposes of great utility. This casing is made of a plastic material, consisting of gutta percha and other fusible

materials, which takes with great sharpness the figure of the mould, and, when cold, possesses a uniform but flexible structure, well adapted to the purposes here contemplated. The section of the casing is shown surrounding that of the spindle, with its interior projections fitting into the grooves formed upon it. The annular space *a* is filled with the blasting charge, care being taken to ram it equally: so that it be everywhere of the same density, and that the granular condition of the powder be not impaired. To fire this blasting charge, a double provision is made. The perforation E through the mass of the spindle, communicates from *a* to the vertex *c* of the shell, which is formed into a nipple, and armed with a percussion-cap. Another perforation leads from *a* to the spherical concavity *b* in the casing, which is the receptacle for the charge.

Thus constructed, and both perforations being carefully filled with slow fire, it is evident that the blasting charge deposited in *a* will be fired, either by the explosion of the cap *c*, when the shell strikes, in which case the priming-fire is conducted along the canal E to *a*, or by the ignition of the slow-fire in the groove *g*, which communicates with the propelling charge in *b*. The advantage of this construction over the ordinary shell will be readily understood. When the shell has been delivered, and has penetrated into the material against which it is aimed, the explosion of the blasting charge follows immediately without chance of failure, and the slightest consideration will show that the result must be destructive beyond any conception we have at present of exploding missiles. In these, the explosion is restrained at the aperture by the end *g* of the spindle, and can only take effect radially around it. The comparison of damage done by the ordinary shell, and by Mr. Macintosh's shell, though only faintly shown in figs. 3 and 4, will serve nevertheless to enable the reader to judge of the effects produced in the two cases. In the one we find a sort of cannon accidentally improvised, of which the aperture of the penetration is the muzzle, and the charge is contained in the shell. The energy of the explosion is thus expended through the aperture—the point, of all others, where it is desirable that it should not take effect. In the other we observe an opposite result. This explosion through the aperture is resisted by the expanded form of the rear of the spindle, and the gunpowder is effective without any reduction from want of re-action, in rending the material in every direction, laterally, about the spindle as a centre.

That the shell should be perfect for the performance of this duty, it is important that certain conditions should be observed in its construction, some of which are conflicting in their nature; that is, one of them must be carried out at the expense, in some degree, of neglecting another. Here a maximum of general advantage must determine the combination. In the first place, the spindle of the shell must be of great strength in order to give solidity, to the entire structure to enable it to overcome the resistance to penetration; and, secondly, the stem, or thin portion of the spindle, must be strong enough to extinguish the mechanical effort of that portion of the explosion which takes place within the limits of the space *a*, estimated in a direction parallel to the axis of the shell. On the other hand, by increasing the diameter of the stem for the sake of increasing its strength, care must be taken that the cavity for the blasting charge be not unnecessarily encroached upon. The section of the spindle shown in fig. 1 approximates to the general fulfilment of objects, but the inventor has improved upon it by extending the cavity *a* towards the nipple *c*, into the head of the shell. That the spindle might possess the requisite strength, it is made of malleable iron; Low Moor iron being preferred. In consequence of the strength of the structure so created, it has a great advantage over the ordinary spherical bomb-shell; the figure of which obliges a large quantity of metal to be consumed in its construction; as it would otherwise be liable to fracture from the propelling explosion before it left the mortar. A comparison of the two, with reference to this circumstance, will show the superiority of Macintosh's lateral-explosion shell; which is still further augmented, by relatively considering that a shell crumbles into a circle at the instant of impact.

In order that the motion of the shell through the air might be as perfect as

the nature of the case seems to admit, the conoidal surface of the head of the ball is turned in a lathe; so that it may be accurately a figure of revolution. Any imperfection in this respect would produce an inequality of resistance about the axis of the shell, and vitiate the accuracy of the aim. A still further precaution is taken to insure the body being symmetrical in weight as well as in figure, with reference to its axis. For this purpose it is placed in a bath of mercury, in which it floats, the line of flotation being somewhat below the nipple. If any motion of rotation about the axis is observed, the preponderance of weight by which it is occasioned must be corrected. Thus perfect in figure and density, the aim receives full effect in practice.

Within the casing common boiler tube is employed in ordnance shells; and in smaller shells for musketry, an internal cylinder of thin sheet-iron. On the outside of the cylindrical part of the shell is a covering of greased chamois leather, the effect of which is to keep the gun clean, and at the same time to prevent windage.

It follows from the greater efficiency of this shell, that guns of smaller calibre will become equal to all purposes of action; and the inventor calculates that a six-pounder shell will produce a result of as high an order as any at present attainable. Of course, it must be understood that this missile is intended chiefly for naval action at long ranges. It would also be immensely serviceable for land operations in carrying stockades, and destroying earth-works. Against troops in the field it would be completely worthless, as its form would render it unavailable in the most destructive kind of practice, *ricochet* firing. That naval warfare, rather than military, should be facilitated by this invention, may be regarded as a fortunate circumstance. The most moderate calculation shows that on the bloody field of Waterloo only one shot in 500 killed or wounded; and a French engineer has gone so far as to assert that only one in 10,000 killed or wounded. This is probably an extravagant opinion, but naval warfare is a more serious matter. At the battle of the Nile, the *Bellerophon*, if we remember right, lost 200 men out of a crew of 750, in about fifteen minutes. An invention, therefore, which renders naval engagements more decisive, is certainly worthy of praise.

There is one application of which this shell is susceptible, and which deserves notice. In our Indian wars our troops are much harassed by the enemy's elephants. These animals carry huge baskets on their backs, which contain, ten, fifteen, and sometimes thirty armed men. They are all but indestructible. As many as thirty rounds of shot will scarcely disable them; and Chuny, the celebrated elephant of Exeter-change, was not dispatched before a number of soldiers had fired about ninety shots into him. One of Mr. Macintosh's shells, exploded by the fuse leading from the propelling charge, would certainly suffice to dispatch any of these moving forts.

Another combination — the "repeating" fire-arm — is represented in fig. 2 applied to a piece of ordnance, but equally applicable for small fire-arms. Here the shot and the expanding wad are both perforated, as shown at *g h*. A cartridge containing a certain number of these shots, with their wads and charges complete, forming one cartridge, is dropped into the gun, and rammed home, as shown in the figure. In that position, the charge *i* of the last shot comes immediately under the vent *j*, which being pricked, primed, and fired, discharges its shot, and ignites the fuse-composition with which the perforation in the ball and wad immediately behind it is filled. This fire communicates with the charge of that ball, and it is fired. Thus, in succession, the whole are fired, at one loading, priming, and adjustment. The figure shows how readily guns on the existing construction may be converted to this new arrangement, or *vice versâ*.

It is important to observe in passing, that in order to prevent the degranulation of the powder on the outside of the charge from internal pressure before combustion, the inventor proposes to introduce a perforated tube longitudinally, and in the middle of the charge. This will protect the outside powder from undue pressure, without intercepting the fire, and, at the same time, it will be itself a missile.

Mr. Macintosh has a gun also for firing under water in close action. The great feature of this contrivance is a conical sheet of vulcanised India-rubber, opening outwards in the thickness of the vessel's side, where a hole has been made for the shot to pass. Immediately the shot has been fired, the cone opens at the apex to allow it to escape; and this having taken place, it instantly collapses without admitting the water. Experiment shows clearly that shot can be effectively delivered under water for short distances, and a lateral explosion shell fired into a ship's side, below the plane of flotation, would at once be decisive.

The following figures will convey an exact idea of the figure, charge, and performance of a 3½ inch lateral explosion shell. Its length is 5½ inches, and the diameter of the tye-bar, or thin part of the spindle, 1⅛ inches. The bursting charge contained in it is 1¼ lbs., and total weight of the missile 7 lbs. 2 oz. The estimated force necessary to tear the spindle asunder by extension is 80,000 lbs.; which latter quantity also represents the lateral rending force of the explosion.

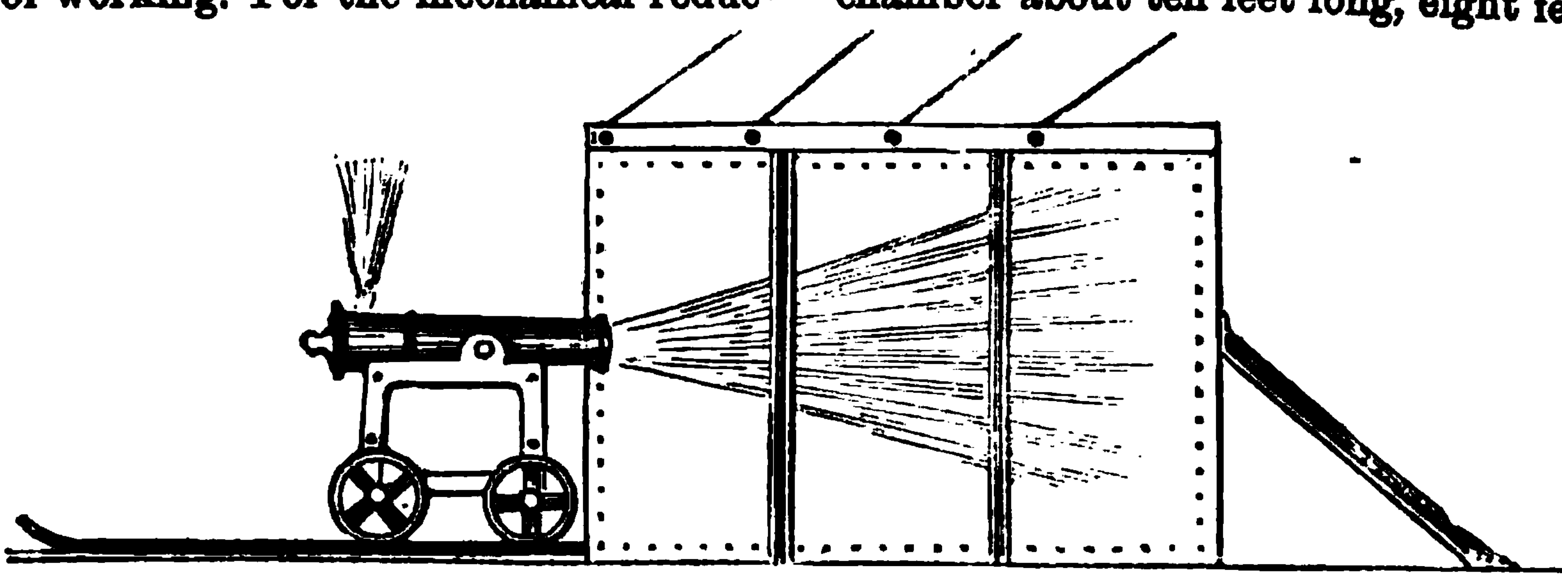
In small arms, the musket-shell on the same principle has a diameter of five-eighths of an inch, and is 1⅞ inches long. With a driving charge of 144 grains, a penetration of 3½ inches has been obtained at a distance of 5 yards, into a block of English oak. The bursting charge is 2½ drachms, and this shell has torn asunder a block of English oak 14 inches in diameter.

SHRAPNEL'S PATENT ORE-CRUSHING APPARATUS.

(Patent dated October 23, 1852.)

Considerable attention has been bestowed during the past week upon a series of experiments with Captain Shrapnel's ore-crushing apparatus, performed at the foundry of the Messrs. Glover, of 168, Drury-lane, Engineers to the Board of Ordnance. The result of these trials tends to establish the efficiency of the invention for operating on the hardest mineral matters with rapidity and economy, on a large scale of working. For the mechanical reduction of the ordinary auriferous quartz—to which purpose the invention is mainly directed—it seems well adapted; the stone being immediately brought to the state of an almost impalpable powder, containing, however, a few small bits which, if necessary, can be operated upon anew.

The general nature of the invention will be readily understood from the accompanying figure. It consists of a chamber about ten feet long, eight feet



high, and six feet wide, the back of which is made of inch and a half wrought-iron, and sides of sheet-iron. These are united in the ordinary way by punching and riveting, and the back plate is stiffened externally by diagonal ribs and the struts shown in the figure. The whole rests upon a framed timber-bed, which is continued in front for the purpose of receiving an iron rail-track, upon which the gun in the figure can traverse. In point of principle, this is nearly all that is essential to the working of the apparatus; though its perfect application for practical purposes introduces a few

details, some of which we shall notice. The operation of the apparatus is as follows:—The gun being charged with powder, and a wad rammed down upon it, a charge of the ore, previously broken into bits sufficiently small for the bore, is rammed down upon the wad, and secured by another. It is now moved forward upon the rails against the front of the chamber, where a circular hole, of a diameter rather larger than that of the muzzle of the piece, is cut to receive it. The muzzle being just introduced within the thickness of the plate, the piece is primed and fired, when the charge is projected against the stout plate at the back of the chamber, with the entire expansive force of the explosion. To relieve the sides of the chamber from the concussion they would sustain by the sudden and forcible injection of expanded air, the roof is formed in doors, which are hinged upon lines parallel to its width, one arrangement of which is indicated in the figure by the dotted lines. Upon the explosion taking place, these doors are suddenly lifted, and so act as safety-valves, after which they immediately fall. In practice, these doors would be overlaid with chains, or otherwise limited in their motion about their hinges. The gun now recoils upon the rails, one or more of the doors in the roof is opened, and a door in the front wall, which contains the perforation for the muzzle. In this state of the chamber it may be entered, if necessary, to remove the *débris*. It would be provided in practice with a false bottom perforated to the minimum size of the broken particles available for the subsequent processes. A drawer underneath this would be withdrawn at convenient intervals, with the ore in a sufficiently minute state of reduction, while the *débris*, kept back by the perforated bottom, would be collected, and returned into the gun, where they would very conveniently fill up the interstices between the larger pieces, and contribute to improve the result obtained. The final operation of separating is performed by a gentle blast, which winnows the lighter, and allows the heavier metallic particles to fall.

The form of the apparatus which we saw in operation at Messrs. Glover's on Tuesday last, though merely intended to afford a rough approximation to the results that would be obtained with a perfect adaptation of parts, and an adjustment of the charges founded upon experience, afforded abundant promise of the practical efficiency of the invention. Masses of Californian quartz were reduced without the silghtest difficulty, the entire charge, scarcely with any diminution, being acted upon. The hardest Aberdeen granite, which we believe has not yet been broken in any of the stamps or ore-crushers, yielding equally with less obdurate materials, and being reduced into a fine powder, which would require but small preparation to become available at once in an elegant branch of the decorative arts—the imitation of stones by mineral papers. The granite pillars of the hall of Fishmongers'-hall are said to have cost 300*l.* each. They might be produced by this method, with equal effect to the eye, at as many sixpences. Ironstone and copper-ore were similarly reduced; and some specimens of the latter from Cornwall and Wales, which were operated upon, especially elicited the approbation of several mining gentlemen who were present on the occasion.

To economise time, several guns could be mounted upon a turn-table, or there might be more than one pair of rails, and each pair might branch off into two, furnished at their intersection with spring-switches; which latter arrangement, when one gun had recoiled along one branch, would allow another gun upon the other branch to pass through to its position for work.

In the present state of the metallurgical arts, it would be difficult to say to what purpose this process might not be applicable, and it is extremely probable that in our iron and copper districts we shall soon be finding it playing a conspicuous part. As regards the crushing of quartz, it has this decided advantage over those arrangements which depend upon ordinary mechanical action, that no machine can stand the rugged nature of rock-crystal, or silicum.

Its saving in working, independently of all considerations of facility

of manipulation, may be set down moderately at 50 per cent.; while the stimulus it will give to mining operations in general, by rendering expensive machinery unnecessary, cannot well be estimated. In the gold colonies, it will prove of great value to miners. Water is, in general, extremely scarce within a convenient distance of the diggings to work the machinery; and to transport ponderous structures across those unprepared and rugged regions, is attended with costs and difficulties of a nature to deter the most enterprising. For a cost of from 300*l.* to 400*l.*, an apparatus on Captain Shrapnel's principle can be procured, which possesses the advantages of being small in bulk, easily moveable, and always ready for immediate use. Served by two men, it is capable of reducing from 30 to 40 tons of quartz per day, without having recourse to water; and there is this collateral advantage—not to be despised in the rude state of society prevalent in the communities of the diggings—that the chamber admits of being converted into a temporary garrison for the defence of the party, or company, using it.

Captain Shrapnel, the author of the present invention, is the son of the celebrated General Shrapnel, whose name will always live in the history of British military art. By this new resource he may probably contribute as much to the perfection of some of the most important of the arts of peace, as his illustrious father has done to those of war.

MACHINE TOOLS FOR AUSTRALIA.

The Gold-fields of Australia have already given much employment to manufacturers in the mother country, have thereby increased its wealth, and have afforded much additional employment to our mechanics. There is, however, one branch of mechanism that has been entirely neglected, although the furnishing their products to the antipodes could not fail of becoming eminently lucrative to our machine-makers, and, at the same time, in a very high degree beneficial to Australia—namely, the providing it with *machine-tools.*

Professor Willis in his Exhibition Lecture, informs us that "In America a variety of contrivances are employed in workshops to facilitate and give precision to ordinary operations,—as, for example, the foot-mortising machine for wood." The inhabitants of the United States have doubtless been excited to the extensive introduction of such tools by the great demand in that country for labour in agricultural pursuits; and if this be so, how much more influence might it be expected to have in Australia, where the gold-fields have withdrawn so many thousands from their former pursuits; where, in consequence, a carpenter is paid the enormous wage of 20*s.* a day, and even a common labourer 10*s.*? Now, by means of machine-tools, the carpenter might put out of hand, perhaps, half a dozen times as much work as he could do without them; besides which, they would enable the common labourer to prepare wood and metal, so that skilled work would only be required for putting together the several parts of an article after they had been prepared by machine-tools.

Machine-tools—it has already been repeatedly said in the *Mechanics' Magazine*—are applicable to a great variety of operations in working wood, for example, to cutting it to different breadths and lengths, and at any given angle, to rebating, morticing, cutting tenons, dove-tailing, boring, &c., &c. Few, if any, new inventions would be required for the fabrication of very many useful machine-tools, since a reference to Bentham's patents of 1791 and 1793, would alone suffice to any machinist for its direction in regard to many of the engines in question. The latter patent, besides its having appeared in the *Repertory*, has lately been printed by the liberality of R. Prosser, Esq., of Birmingham, and by his favour copies of it may be there obtained at the very low price of a few pence. The article, "Good Tools, and good Materials," in No. 1498 of the *Mechanics' Magazine*, may also be consulted.

There are said to be already saw-mills in Australia; and, doubtless, where the labour of man is so difficult of obtainment, *brute* force would soon be employed to work machine-tools. A donkey would suffice for giving motion to small ones; works on a larger scale would require the force of the ox or the cow, both of which are employed for analogous purposes in Russia. But still the mother country would be looked to for the machines themselves, and thus an extensive branch of industry would be obtained for our manufacturers.

It might well answer to put some of the machine-tools on *wheels*, whereby one and the same tool would suffice for several small workshops, cutting out and preparing in each one, during a day or a week, the seve-

ral materials that might require several days or weeks to put together. Why not moveable machine-tools as well as moveable steam-engines? The latter were first invented for use in Portsmouth Dockyard; their applicability to a great variety of temporary uses soon caused an extensive introduction of them elsewhere; so it might be with moveable machine-tools, both at home and abroad. One can fancy an Australian carpenter possessed of one of them, going to one settler after another in a newly-peopled district, and, with the help of a common labourer, fabricating cheaply, quickly, accurately, doors and windows for the hut, and many an interior fitting that would not otherwise be aspired to. Where wood abounds, and roads are bad, it would be easier to take machine-tools to the wood than to bring the wood to the machine.

TRIAL TRIPS OF THE "BENGAL."

THE new gigantic iron screw steam ship *Bengal*, intended to be placed on the Southampton, Malta, and Alexandria mail-packet station, went out from Southampton on a trial trip on Saturday, under the command of Mr. Black, the chief officer. A large party of gentlemen were on board, among others, Captain Thornton and Messrs. Hadow and James Allan, Directors of the Peninsular and Oriental Steam Company; Captain Austin, C.B., R.N., Superintendent of Packets at Southampton; Mr. William Maclean, Secretary of the Board of Customs; Mr. Powell, Collector of Customs at Southampton; Lieutenant J. R. Engledue, R.N., Superintendent, and Mr. Andrew Lamb, Engineer in Chief of the Peninsular and Oriental Company.

The *Bengal* is a beautifully-modelled steam ship of 2,400 tons burden and 470-horse power, recently built for the Company in the Clyde. Some idea of her enormous dimensions may be formed when it is stated that the hull is 20 feet longer than the *Great Britain*, and that to walk round the vessel on the main deck, a distance very slightly under one-eighth of a mile has to be traversed.

She left the docks at 10 A.M., and rapidly steamed towards Stokes Bay, where, after several trials of her speed had been made, giving the following results, she passed through the fleet at Spithead towards the Nab Light, and thence through Cowes Roads to Southampton:

1st mile run in	5m. 40s.,	equal to	10·315	knots.
2nd	5m. 9s.,	,,	11·650	,,
3rd	5m. 35s.,	,,	10·746	,,

giving an average speed on the three runs of 10·904 knots, equal to about 12½ statute miles an hour. This great speed for a steamer of so large a tonnage in proportion to horse power, propelled on the screw principle, was pronounced by the professional gentlemen on board to be very satisfactory. The draught of water of the *Bengal* during the trial was 15 feet 4 inches forward, and 15 feet 8½ inches aft. Coals on board, 520 tons; water, 35 tons. The engines, which worked most admirably, made 27 revolutions, driving the screw about 60 revolutions per minute. The load on the safety-valve was 12 lbs.; vacuum in the condenser, 27; nominal horse power, 465.

The *Bengal* will be the first screw steam ship ever employed on the main line of the Indian mail service, and we understand the Directors of the Peninsular and Oriental Company have the power, under the terms of their new Admiralty contract, to use either paddle or screw vessels, provided a certain minimum speed of 10 knots is attained.

On Tuesday the *Bengal* went out again for an official trial trip, with Messrs. Murray and Luke, the Government surveyors, on board. A slight improvement in speed over the previous trial was realized, an average of the four runs without canvas at the measured mile in Stokes Bay giving 11·123 knots, equal to about 13 statute miles per hour. The engines worked very smoothly, the draught of water of the *Bengal* being 15 feet forward and 16 feet aft.; coals on board, 480 tons; water in tank, 40 tons; and about 20 tons dead weight. The *Bengal* is fitted with Lamb and Summers's patent flue-boilers, the same as those in the other vessels of the Peninsular and Oriental Company.

TRIAL TRIP OF THE "AGAMEMNON."

THE *Agamemnon*, 91, screw steam ship, of 550-horse power, Captain Sir Thomas Maitland, slipped her moorings in Sheerness harbour, at 7 A.M. last Thursday, and proceeded on her trial trip (drawing 24 feet 3 inches aft, and 22 feet forward) down as far as the Mouse Light vessel in the West Swin, a distance (from her moorings) of 11 nautical miles. She ran six trips between the Nore Light vessel and the Mouse Light vessel, a distance of 7¾ miles—during which time she was compelled to ease her engines and go at half speed, in consequence of her passing so many vessels in her direct course. She anchored at the Nore at 1·30 P.M. On each trip she went round in very little more than her own length, leaving a perfect arc of a circle with her displacement of water around her. She steers remarkably easy.

She has to receive about 52 tons of powder and shell on board, which will be stowed in the fore magazine and shell-rooms. Her trial has been most satisfactory as to her speed and stability of machinery. Not the slightest derangement took place in her machinery during the whole time of her being under way, except in consequence of a quantity of small coals collecting at the bottom of the coal bunker delivery shoots, produced by breaking in stowing the bunkers, the result of which was the small run through the bars, filled the ashpits, thereby reducing the draught, and a sufficient quantity of steam could not be obtained at all times to keep her up to her speed, and under these circumstances, the following statement will show what she has done:

Trial	Revolutions per minute.	Nautical miles.	Geographical miles.
No. 1	60	9·82	11·29
No. 2	60½	9·97	11·47
No. 3	58¾	9·74	11·20
No. 4	60½	10·20	11·73
No. 5	60	11·00	12·65
No. 6	60	9·40	10·81

making an average rate, in nautical miles, of 10·02, and in geographical miles of 11·52, by Massey's patent log.

Her maximum rate, by the common log, was at the rate of 10·2 nautical and 11·73 geographical miles, and minimum 9·8 nautical and 11·27 geographical miles.

The nautical mile being 6,075 feet, and the geographical 5,280 feet, will give a difference of 795 feet; consequently, 10 nautical miles will give 11·5 geographical miles.

The force of the wind during the trial was from 5 to 6, fresh and strong breezes, from the south-east, and steering her course down toward the Mouse, brought it broad on her starboard bow and abaft the beam on her run towards the Nore. There has not been any trial of her under canvas. She has most certainly proved her steaming qualities, under the disadvantages before stated, to be superior to any man-of-war steamer yet produced by any nation.

SHIP-BUILDING IN SUNDERLAND AND NEW YORK.

The comparative statistics of the ship-building trades of Sunderland and New York during the past year have been published. The *New York Journal of Commerce* gives the following figures of the trade in that city:—The total number of vessels at present on the stocks, or launched during the year just closed, is 97, aggregate tonnage, 73, 615; and of this amount 52,339 have been launched, and 21,276 remain to be launched. The vessels may be classified as follows:

	Steam-ships.	Steam-boats, Ferry-boats, &c.	Ships.	Other Vessels.
Launched	11	30	10	18
On the Stocks	5	12	8	3
Total	16	42	18	21

The following is a comparison of five years:

	Launched.	On Stocks.	Aggregate tonnage.
1848	36,649	15,710	52,359
1849	38,085	23,890	61,965
1850	52,225	27,516	79,741
1851	65,521	15,240	80,761
1852	52,339	21,276	73,615

Including the vessels on the stocks on the 1st of January, 1853, the Sunderland papers give the following Table of comparison:

	Sunderland.		New York.	
	Vessels.	Tons.	Vessels.	Tons.
Launched	142	56,645	69	52,339
Building	75	35,414	28	21,276
	217	92,059	97	73,615

The vessels built at Sunderland were all sailing vessels. Incidentally it may be stated that the total number of vessels arrived at New York in 1852 was 3,882, and of these 1,013 were British. The increase of the British lately has been very great, the comparative numbers having been as follows:

	Total Arrivals.	British.
1850	3,487	661
1851	3,888	966
1852	3,882	1,013

THE TRADES OF BIRMINGHAM.

NOTWITHSTANDING the high price of copper—and it is likely to be still higher—almost every description of copper and brass manufacture is brisk. The advance has generally been at least 20 per cent. There is a great demand for brass wire, and according to the statements of all the principal firms there has been as yet but a small reduction of demand.

The edge-tool trade is very busy, and the manufacture of hollow ware in the neighbourhood of West Bromwich was never more thriving. The small makers, especially of saddlers' ironmongery, suffer, however, by the price of iron. They cannot move the merchants and factors to a corresponding extent. In this particular the great firms of the district who are able to contract for their iron in large quantities have a considerable advantage over the smaller men.

In the tin-market there has not been any additional advance, but there has been no reduction upon the recent advances, and the manufacturers are, in many instances, working at a loss, unable to realise the extra prices rendered necessary by the dearness of the raw material. The iron trade remains firm, but no one believes that the masters can maintain existing prices for any length of time.

Amongst recent inventions in operation here may be noticed an ingenious machine for cutting corks, made by Mr. Knight, from the patented drawings of a London house. The first machine, which is calculated to cut as many corks as eight pairs of hands, was forwarded from here on Thursday evening last, to Mr. J. W. Russett, of Birchin-lane. This invention will effect a great change in the trade of cork-cutting.

THE IRON TRADE.

Birmingham.—There is little new to be said with respect to the staple trade of South Staffordshire and the adjacent districts. The best qualities of iron, such as H. B., are fetching the high prices fixed at quarter-day, but there are makers, and always were, who are taking orders at lower figures. It is stated that there are considerable orders at the works for plates and rails for North America, but if the last accounts be correct, high prices are beginning to produce their natural consequences. American correspondence, both public and private, proves what had already been foreseen, that exorbitant rates are giving a stimulus to manufacturing energy which, sooner or later, must operate injuriously upon British interests. The official reports show that while America produced no more than 18,000 tons of rails in 1852, not less than 300,000 tons were imported from this country in the same year. This, we are informed, is fast being reversed. One iron company, the Montour, has contracted for 20,000 tons with a railway company, to be delivered within the year; the same works were making 5,000 tons for another railway; the production of that one company for these orders exceeding by more than one-third the whole produce of the States last year. These facts, given upon undeniable authority, ought to operate as a warning to ironmasters in this country against the exaction of exorbitant rates such as those now in force. The price quoted for hot blast mine pigs is 5*l.* 10s., 13*l.* for plates, and 11*l.* for bars and rods.

The accounts from America, coupled with the downward tendency in Liverpool and Glasgow, evidently point to a speedy change in the price of iron. Nor will the accounts received from Ireland tend to confirm present prices here. It appears that a most important discovery of iron has been made within the last few days in the county of Waterford, between Curraghmore and Carrickbeg, and already miners are at work, and hopes are entertained that the yield will prove productive. The preliminary operations have been undertaken by an English mining company, at the head of which is said to be Baron Rothschild. The district, it is believed, contains a vast quantity of iron, and the result of the experiment just made is very satisfactory.

Glasgow Pig Iron-market,—Glasgow, Feb. 5.—The downward movement in the value of pig iron, noticed last week, has continued without a check during this—warrants for mixed numbers, which on Saturday last were quoted at 61s., having been sold yesterday at 58s. To-day a panic prevailed here, and sales were made to some extent at 55s. 6d., early cash, after which the market appeared relieved; but, although there was nothing pressed, little or no disposition was evinced to purchase.

America.—By the Cunard steamer *Arabia*, which arrived in the Mersey on Sunday evening, with advices from New York to the 27th ult., we learn that Scotch pig iron held for 37 dollars 50 cents., six months. Sales were, however, restricted to small lots for immediate use.

INSTITUTION OF CIVIL ENGINEERS.

THE ordinary weekly meeting of the Institution was held on Tuesday evening last, James Simpson, Esq., Vice-president, in the chair.

The evening was entirely devoted to the discussion of Mr. Joshua Richardson's Paper, "On the Pneumatics of Mines." The discussion was commenced by alluding to the very different condition of the ventilation in the mines and collieries of the various districts of Great Britain. Some having humane proprietors, educated engineers, and intelligent overlookers, by whom all scientific and practical knowledge was brought to bear on the question; whilst others were worked by men, who cared little for anything beyond mere gain, and went on without other supervision than that of the most ignorant overmen, by whom matters were allowed to fall into a bad state, the whole being entirely dependent on "natural ventilation," by which was meant merely sinking two pits, one of which was intended for the down-cast, and the other for the up-cast, the motion of the air being determined only by the difference of temperature of the two shafts. If these two shafts were compared, it would be admitted that some degree, either of Government or other inspection was necessary.

The quantities of atmospheric air necessary for the healthful condition of mines, under various circumstances, were then given, as being in round numbers 100 cubic feet per man per minute, for mines free from deleterious gases, up to as much as 500 or even 600 cubic feet in very fiery and bad mines.

The various means of forcing air into and exhausting air from mines were then explained—more particularly touching on the "Water-blast" used in the Hartz Mountains and in Belgium, by which it appeared long galleries were very rapidly cleared, even of powder smoke. Gurney's steam jet and Struve's aërometer, Combe's curved arm fan, the pneumatic screw, and the ordinary exhausting or rarifying furnace, were compared; and it was contended, that though the furnace was the simplest system, there were occasions when, from its action not being susceptible of acceleration, it would be ineffective in rapidly clearing a mine after an explosion; whereas, by increasing the velocity of Struve's aërometer, its active power would be rendered so much more effective, that the mine would be immediately cleared, even in spite of the destruction of the brattice, or of the gallery doors. The accident at the Middle Dyffryn Colliery, caused by the explosion of the gas at the exhausting furnace, was explained to have arisen, most probably, from the introduction of such a large quantity of atmospheric air, as brought the air in the mine to its most explosive condition. This most frequently occurred in new mines, and where, generally, every attention was paid to copious ventilation.

Constant attention to the indications of the barometer was enforced, as the best mode of avoiding accident; and it was shown, that however well anemometers might be constructed, it was necessary to make an allowance for friction, and to have them well compared and regulated, before trusting to them.

The existence of a condition of "natural ventilation" was strongly contested. It was urged that such a state was not compatible with any security, as the difference between the columns must depend on the deterioration of the air in the mine, by the breath and the animal exudations of the men, and other causes; the current must become sluggish at night, when the mine was not working, the course of ventilation might suddenly change with the direction of the wind, and all the ventilating arrangements would be rendered of non-effect.

It was contended, that Government inspection, to be really useful, should be applied to giving information to the proprietors and overlookers, and observing whether the best-known means were adopted for the prevention of accidents and for saving life, when they did occur. All the rest might be safely left to those men, who, having embarked large capitals in the undertakings, would embrace the best methods of making their speculations profitable, even supposing them not to be animated by any higher object.

Attention was directed to the Institute of Mining Engineers, recently established at Newcastle-on-Tyne, under the presidency of Mr. Nicholas Wood (M. Inst. C.E.); and it was hoped, that by its means, knowledge might be more extensively spread among that valuable class, the overmen of the North, whose practical skill only required to be allied to a little more scientific knowledge, to render them a most useful class, whence to draw the overmen for other districts, where there was still a lamentable deficiency of knowledge and practical skill.

The following Paper was announced to be read at the Meeting on Tuesday, February 15th, "On the use of Heated Air as a Motive Power." By Mr. C. B. Cheverton.

JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.—Feb. 8.

Extension of Heath's Patent for Steel.

The Members of the Council present, were the Lord Chief Justice, Sir John Jervis, Sir J. Patteson, the Judge of the Admiralty Court, and Sir Edward Ryan.

Mr. Webster appeared for the petitioner; Sir F. Thesiger, Mr. T. Jones, and Mr. Deighton represented the opponent of the patentee, Mr. Henry Unwin.

In the month of April, in the year 1839, Mr. J. M. Heath obtained a patent for the improvement of the manufacture of steel; and this was an application, which was made by the widow of the deceased, for the extension of the term for which the patent was granted. The discovery of the patentee consisted in introducing carburet of manganese in converting iron into steel. According to the statements, the result of this invention was that English iron was rendered nearly as serviceable as the best Swedish, and the price was reduced about one half, and a great saving was also effected in what was termed waste, or scrap. The patentee discovered that, by introducing into the crucible at the time the cast steel was at a given temperature, a composition of manganese and carbonaceous matter, an effect was produced similar to that which was caused by the introduction of carbonate of manganese. By this discovery a great reduction in the manufacture of the article was effected. Oxide of manganese was known to have effected a beneficial influence on cast steel, but it riddled the crucibles, and the fused metal escaped into the furnace. By the use of the patentee's composition this inconvenience was entirely obviated. It was urged, on the part of the petitioner, that, before this patent was obtained, the best cutlery could only be manufactured from sheer steel, as it was not possible to weld cast steel with iron.

On the former hearing, which took place on Tuesday last, Mr. C. Atkinson, of Attercliffe; Mr Carne, of Sheffield; Mr. Brand, Professor of Chemistry at the Mint; Dr. Ure, and Mr. Waddington, Lecturer at King's College, were called to support the statement which was made on behalf of the petitioner.

It was contended on behalf of the opponent of the petition, that after the patent had been granted to the petitioner, it was discovered that a result similar to that produced by this patent would be effected at a less cost by introducing oxide of manganese and carbonaceous matter, instead of carburet of manganese into the crucible with the iron. The patent was described in the specification to be "the use of carbonate of manganese in any process in which iron is converted into steel," and the process was described to be the introduction of broken steel, or malleable iron and carbonaceous matter into a crucible, along with 2 or 3 per cent. of their weight of carburet of manganese. The opponents to the petition made all of this new process, and by that means the oxide of manganese and the carbonaceous matter combined together, and formed a carburet of manganese. Subsequently, by the same process, but at a higher temperature, the carburet combined with the steel, and produced the desired result. If the petitioner had been aware of this cheaper method, it was urged that it ought to have been set forth in the specification.

The case was adjourned in order that the petitioner might have an opportunity of bringing before the Council the accounts of the profit and loss of the patent.

Mrs. Heath, as administratrix to her late husband, now deposed that he had expended very large sums of money in making experiments and manufacturing articles of cutlery, which had been given away to show the quality of the steel; and that 200*l.* would cover all his receipts from the working of the patent.

The Right Hon. Sir Stephen L. Lushington pronounced judgment to the effect that the Council were of opinion that not only had a great advantage accrued to the public by the introduction of this invention, but that the patentee had not received any remuneration for its working. Under these circumstances the Council would recommend to her Majesty that there should be an extension of this patent for seven years.

Dr. Lushington said their Lordships were of opinion that the invention of Mr. Heath possessed very considerable merit. The alteration which he had introduced in the employment of oxide of manganese with carbonaceous matter, instead of carburet of manganese, did not materially detract from the original invention, and their Lordships were disposed to advise Her Majesty to continue the patent for seven years. Of course, they, in so doing, did not express any opinion on the validity of the patent—a question now pending before a competent tribunal. In the event of the decision being adverse to the patent, the renewal will fall to the ground.

Judgment for the petitioner accordingly.

THE CONICAL FLOUR-MILL COMPANY.

On Wednesday morning last, a large party of engineering gentlemen, and of others engaged in an extensive way of business as millers, assembled at the well-known flour-mills of the Messrs. Pavitt, High-street, Wapping, to witness the performance of two mills constructed by Mr. Middleton on the principle of Westrup's Patent. In the same establishment are seven other mills of the ordinary construction, and the trial of relative merits was between the two conical, and the most effective pair of the flat mills. The result, as will be seen, proved to be immensely in favour of the conical

system; the summary of advantages over the present system being, upon the most moderate estimate, a profit of upwards of one shilling upon every quarter of grain, while the quality of the article produced, according to the opinion of experienced bakers, is far superior. The economy of this new system of grinding is found to affect very sensibly the detail of operations both in the mill and in the bake-house. In the former, it becomes possible to grind up a large portion of farinaceous matter now rejected in the form of bran, that is, to exhaust the husk of the clavel more completely, and therefore to yield a larger quantity of pure farina. In the latter, the tedious but critical duty of watching for what is technically termed "the sponge," or rising of the dough, is quite superseded. At present, if this be neglected, the dough falls again in the oven, and the bread is sold at a reduced price, which is a serious disadvantage.

Under the conical system of grinding, in consequence of the greater proportion of gluten contained in the mass, the acids do not escape so rapidly, and the sponge takes place in the oven. Upon the whole, there is a large gain to the public; for besides a saving in fuel, it is capable of increasing the bread of the people to the value of 2,460,428*l.* a year, which, at 6*d.* per loaf, would give them 81,857,120 more quartern loaves a year.

The old flat flour-mill ordinarily consists of a lower fixed circular stone, and an upper revolving one, each of about 4 feet 6 inches in diameter. The wheat being introduced through an aperture, is drawn in, and ground between the revolving and the fixed *dressed* surfaces. The average weight of these stones is about 14 cwt., and it is ordinarily found that the grinding surface presented is so extended, as to render the delivery of the flour extremely slow and uncertain, notwithstanding the great velocity of the running-stone, which is generally 120 revolutions per minute. The evil arising from this circumstance is, that the flour, finding only a partial escape, is triturated and re-triturated, to the great ultimate injury of the meal.

Some idea of the power required to keep such massive machines in operation may be gathered from the fact, that a single pair of stones, 4 feet in diameter, require the power of a four-horse engine to maintain the needful speed. This enormous power becomes necessary, in consequence of the great weight of the "top stone," the rapid rate of revolution, and the very large amount of friction produced by the process of grinding so glutinous a substance as meal between such extended surfaces.

These are the principal objections to the old flat mill system of grinding, which has been the universal one in use in all parts of the kingdom for a considerable time; the only variation in practice consisting in the motive power. Most commonly steam power is employed, but when the locality admits of its introduction, the cheaper, and more uniformly certain agent, water, has been brought into action. In all other respects, the mechanical detail of the system has been uniformly the same.

The "conical" mill is intended to obviate these defects, and a very few remarks will suffice to show that its inventor has not only detected their causes, but has brought into operation a most philosophic, and therefore successful combination of grinding and separating agencies, in which these defects have disappeared to an extent which leaves little to be desired. The beneficial changes effected may be succinctly enumerated. First, the reduction of the weight of the running-stone from 14 cwt. to 1½ cwt., by placing it beneath instead of upon the fixed one; second, the reduction of the size of the stones in the proportion of 3·34 to 1; and thirdly, the giving to the stones a new form, that of the frustum of a cone. The advantage of lessening the diameter and weight of a mass of which the one is 4 cwt. and the other 14 cwt., will be apparent, when it is considered that its effective velocity is 120 revolutions per minute, and that this velocity must be sustained against the enormous friction of the grinding surfaces. The altered position of the running-stone admits of a much more delicate adjustment of the opposing surfaces, and gives to the miller an easy and effective control over the most important portion of his operation. The conical form facilitates the discharge of the flour, and obviates the clogging and overheating of the old practice. In addition to these advantages, by a judicious modification of the ordinary mode of dressing, or rather by a combination of the mill with the dressing-machine, a perfect separation of the flour from the bran is effected at the moment the grist escapes from the stones. The bran still remains in the mill, and falls by its own gravity to a second pair of stones, in all respects resembling those already described.

Both pairs of stones are mounted upon the same spindle, and of course impelled by the same gearing. The operation of the lower pair need not be described; they complete the process, and leave nothing unconverted into flour which could add either to the weight or the quality of the loaf. In considering this arrangement, we cannot fail to be struck with the analogy subsisting between it and that which we observe in the

construction of the jaws of animals—a circumstance which assures us of its philosophical superiority.

There were three trials as regarded the old system and the new. The first experiment on the old mill gave a discharge of 16 lbs. of flour in 5 minutes, which was equal to 192 lbs. per hour, while upon the patent mill, there was a discharge of 38½lbs. per minute, or 462 lbs. per hour. The difference, therefore, on that experiment was against the old system 270 lbs. per hour. The second experiment tried was even more favourable as regarded the new system.

Two conical mills, worked against two on the flat principle for an hour, ascertained exactly, and with the following results:

Conical mill	(No. 1)	produced	8¾	bushels.
Do.	(No. 2)	„	7½	„
Flat mill	(No. 1)	„	3	„
Do.	(No. 2)	„	3	„

The Principles and Practice of Linear Perspective divested of all Difficulty. By RICHARD ABBOTT, F.R.A.S. Longman and Co.

To insist upon the paramount importance of the study of perspective drawing at the present day, when the liberal arts are being pursued with a vigour, and an amount of success, long unknown in this country, is wholly unnecessary. The geometrical difficulties of the subject have undoubtedly operated with considerable effect to keep it unduly in the back ground as an element of art-education, and hence too much has been left to the unaided judgment of the eye; as even now is too frequently apparent, though happily in less revolting degrees than heretofore. Thanks, however, to the wide diffusion of correct ideas of taste, and principles of form, and to the universally accessible facilities now afforded by a cheap and excellent literature, there is no longer any reason why this most necessary science should remain uncultivated; and we shall, probably, never again incur the reproach conveyed in Hogarth's bitter satire upon the artistic productions of his own time.

The work before us, as its title indicates, furnishes the student with the few main principles of operation which suffice to obtain the perspective projection of simple objects, such as are bounded by planes or cylindrical surfaces, and at the same time it lays the ground-work in the mind for the full apprehension of so much of the intersection of planes and lines as is necessary to enable the reader to perceive that he is endeavouring, in making a perspective drawing, to exhibit upon paper the intersections with the plane of the picture of the planes which contain the visual rays. Upon the perfect realization of the imaginary intersection of these planes, in the exact relation which obtains with the original object, depends the facility with which the student will apply the rules in any given set of circumstances. Considering the extreme value of this fundamental knowledge, the author is at great pains to put it in the form in which it is most easily acquired: and with the aid of well-projected diagrams, and clear illustrations, he will be found to have been quite successful. Proceeding upon this basis, he gives a profusion of examples carefully graduated in difficulty, the study of which will fully familiarize his reader with the practice to be pursued in every ordinary case.

With regard to the system of perspective which the author has developed in this work, though it possesses some advantages in point of practice, it appears open to two objections, which, as far as they go, seem calculated to embarrass the student unnecessarily. In the first place, the projection of a point is obtained by the introduction of the hypothesis that the horizontal planes containing the original point and the point of sight revolve in opposite directions about their intersections with that plane, into the plane of the picture. The geometrical conditions of the problem are not the less fulfilled by this supposition, but it intervenes between the system of imaginary planes and their realization in the mind of the student. Moreover, as this supposition is not essential to the perspective, it is as well to avoid any dependence upon it. The second objection is, that the resulting perspective is not the perspective as seen from the given point of sight, but that which belongs to the reverse side, and it is to that extent unphilosophical. As regards the correct perspective representation of an object, this is not an objection of much moment; but for practical purposes it is productive of some embarrassment. Geometrical considerations strongly suggest its adoption, how-

ever, and the author has the high example of Nicholson before him, whose system and arrangement are identical with his own, and the exposition of which he has considerably simplified. For our own part, however, we much prefer the method of Fielding and others, as directly conforming in principle to the arrangement of the visual planes which we imagine before us whilst looking at an object, and therefore admitting of more easy reflection on the part of the student.

These strictures must be understood to apply to the principle upon which the system of perspective which the author has adopted proceeds, and in no degree to his treatment of it, which is in every way perfect. The student will find no difficulty in acquiring a sound knowledge of the subject from these pages, and the author has conferred a great benefit on the artistic community by supplying them with this aid. He is a mathematician of repute, and known as the author of an elaborate work on that subtle branch of analysis which was called by its inventor, the celebrated Legrange, the "Calculus of Variations."

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING FEBRUARY 10, 1853.

Henry Bessemer, of Baxter-house, Old St. Pancras-road. *For improvements in the manufacture, refining, and treating sugars; part of which improvements are applicable for evaporating other fluids.* Patent dated July 24, 1852.

Claims.—1. The use of close or covered vessels for clarifying and elevating the liqour.

2. Heating by hot air, hot water, or other heating medium below 212° Fahrenheit, the vessels used for the defecation or clarification of saccharine fluids.

3. A method of discharging saccharine fluids from filtering drums. (These filters were described in a former patent of Mr. Bessemer's. The improvement consists in the addition of peculiarly-formed scoops within the drum, by which the filtered liquor is raised and discharged at one end of the apparatus.)

4. The combination and working of two screws in one pan or vessel (for evaporating purposes).

5. The use of two or more threads in the construction of screws for evaporating.

6. A mode of scraping the threads of the screws, and rendering such threads or discs more rigid by making them thicker at the central part and becoming gradually thinner towards the outer edge.

7. The use of steam to displace the heating media used to evaporate saccharine fluids, and using such steam to heat the partially granulated sugar before discharging it from the pans. (The pans are in this case formed with jackets in which the heating media circulate at a temperature not higher than 212°; as it is desirable, however, in order to facilitate the process of granulation, that this heat should be increased as the operation progresses, steam is forced into the jacket and the water displaced thereby, the circulation of the steam being maintained until the sugar has reached a fit condition to enable it to be discharged from the pan. The hot water is then readmitted, and the process continued as before.)

8. A combination of apparatus for cleansing or curing sugars. (This apparatus is an improvement on one described by Mr. Bessemer in a former patent. The original machine consisted of a hollow circular table revolving around a central shaft and covered with a permeable material, on which the crystals of uncleaned sugar were continuously spread, and a jet of water directed within the table, a partial vacuum was formed, in order, by exhaustion, to cause the water to pass rapidly through the sugar, and thus to separate the molasses from it. The action of the vacuum is still preserved in the improved apparatus, but it is confined to portions only of the table, and does not take effect on its entire surface at once, by which means the separation of the molasses from the sugar immediately under its operation is rendered more rapid and perfect.)

9. The filtration or separation of dust, soot, or other solid matters, which may be floating in or mechanically mixed with atmospheric air, when such air is to be brought in contact with saccharine or other fluids for the purpose of facilitating evaporation. (This is effected by exhausting or forcing the air through a screen of silk forming a division in a closed chamber, the air entering at one end and passing out at the other.)

10. A mode of treating and combining albuminous matters with charcoal to be used in the manufacture of sugars. (The albuminous matters, whether blood, eggs, &c., are first evaporated almost to dryness, at a low temperature, and then mixed with powdered charcoal and moulded into bricks, which may be transported to hot climates, and will continue in good condition for a considerable length of time. Before being used they are reduced to powder and diffused through warm water.

Henry Houldsworth and James

HOULDSWORTH, both of Manchester, silk manufacturers. *For certain improvements in the fixing, extending, and holding of cloth to receive embroidery, and in apparatus applicable thereto.* Patent dated July 27, 1852.

The improvements specified under this patent are intended to be supplemental to those of Mr. H. Houldsworth under his patent of June 10, 1852 (see vol. lvii. p. 497). They consist in stretching and fixing cloth or other fabric, to be embroidered in curved frames, so that although the working is performed in straight lines, or with straight rows of needles, the effort of the cloth to recover its original unextended state, when released from the frame, will cause the pattern of embroidery to assume a curved form and to appear as if worked in curved lines. By this arrangement many beautiful effects may be produced without in any way interfering with the ordinary disposition of the needles, and the form of curve may be infinitely varied.

Claim.—The fixing, extending, and holding of cloth, or suitable fabrics, to receive embroidery in the peculiar manner described, whereby patterns or rows of embroidery worked in straight lines, or by rows of needles arranged in straight lines, assume a curved form when the cloth is relaxed and returned to its ordinary state of non-extension; and also the various apparatus described for fixing, extending, and holding cloth in the manner required to produce the said results and all such modifications thereof, or of cloth-frame apparatus generally for the aforesaid purpose.

PETER ARMAND LECOMTE DE FONTAINEMOREAU, of South-street, Finsbury. *For certain improvements in the construction of taps and cocks for fluids and liquids.* (A communication.) Patent dated July 29, 1852.

The peculiarity of this improvement, which is exhibited under a variety of modifications, is the employment of a tube of vulcanized India-rubber surrounding the valve-spindle, which acts as a spring to bring the valve back to its seat, when the pressure by which it is held away from it is removed. The valve also is covered with a tubular portion of vulcanized India-rubber, which enables it to fit closely to its seat and thus prevents leakage; this India-rubber covering is adopted under all circumstances, whether the valve is conical, cylindrical, or flat-surfaced.

Claims as above.

JOHN MARTIN, of Barmer, Norfolk, farmer. *For improvements in implements for hoeing.* Patent dated July 29, 1852.

These implements are intended for hoeing or banking up earth against the sides of ridges or rows of planted vegetables. They consist of a strong rectangular frame-work mounted on two bearing-wheels, which serve to give motion to the working parts, and supported by smaller wheels at the hinder end, which serve also to regulate the depth to which the hoes are to enter the ground. These hoes are mounted on horizontal shafts driven by gearing from the bearing-wheels, and set in constant revolution during the travel of the machine, so as to throw up the earth sideways, in ridges or banks, against the rows of plants. The number of hoes and hoe-shafts may be varied and their distance from each other regulated according to the space that is required to intervene between the ridges.

Claims.—1. The general arrangement and combination of mechanism for hoeing agricultural crops.

2. The application and use of revolving hoes.

FREDERICK WINTER, of Eldon-place, Finsbury, roche-manufacturer. *For certain improvements in the construction of machinery for supplying rotatory motion to carriages, vessels, and water-mills.* Patent dated July 29, 1852.

The *first* part of this invention consists in "supplying rotatory (?) motion to vessels by means of parallel propellers with perpendicular floats working on an endless chain," or on a band of gutta percha or other elastic material.

The *second* part of the invention consists in "supplying rototary (?) motion to carriages, by means of parallel propellers with perpendicular clamps or claws linked together and forming an endless chain."

The *third* part of the invention consists in "supplying rotatory motion to water-mills, by means of troughs fixed at regular distances and moving upon an endless chain passed perpendicularly down a hollow spout or shaft.

JAMES DENTON, of Oldham, Lancaster, spindle and fly-maker. *For certain improvements in the machinery or apparatus for preparing cotton and other fibrous materials.* Patent dated July 29, 1852.

Claim.—The adaptation of a lump or weight mounted on the upper part of the spindle leg or legs and connected to the presser-finger, so as to move together.

AUGUSTUS EDWARD LORADOUX BELLFORD, of Castle-street, Holborn. *For certain improvements in the manufacture of sheet iron.* (A communication.) Patent dated July 29, 1852.

The object of this invention is to manufacture sheet iron of a quality resembling as nearly as possible the Russia sheet iron; and this is effected by a combination of rolling and hammering processes, in the following order:

A flat plate having been first forged from

any good iron, and rolled to a convenient thickness, is cut up into pieces called "largets," each weighing about 14 lbs., or of any other convenient weight and size. Each larget is then heated and passed several times between heavy rollers, after which four of them are rolled together between heavy rolls, and any irregular projections cut off. They are then heated separately and rolled, until they are brought to somewhat near their ultimate intended size, about 56 × 28 inches, when they are again heated and rolled, which concludes the first part of the process. A pile is then made of the rolled plates, which is enclosed by an outer sheet to prevent access of air to the plates, and heated in a furnace up to a cherry red. It is then taken out, and about twenty of the plates are piled together, with powdered charcoal between them, and in this state they are well hammered by a hammer weighing about 250 lbs. After which they are subjected to a second and final hammering. In this case they are piled one hot and one cold alternately to the number of from 40 to 60 in a pile, and the hammer used is a heavier one, weighing about 900 lbs. After this operation, which effects the planishing of the plates, they are annealed in the usual way, and are then ready for the market.

Boiler plates, and iron plates of inferior quality, may be considerably improved in quality by rolling them while hot, with powdered charcoal laid between them.

The peculiar features of the invention are stated to consist:

1. In manufacturing sheet iron by rolling or hammering the sheets when piled together in a heated state, and with powdered charcoal between the sheets composing the pile.

2. In hammering or rolling sheet iron when laid up in piles composed of hot and cold sheets alternately, for the purpose of planishing the same.

JOHN GERALD POTTER, of Over Darwen, Lancaster, carpet manufacturer; and MATTHEW SMITH, of the same place, manager. *For certain improvements in the manufacture of carpets, rugs, and other similar fabrics.* Patent dated July 31, 1852.

This invention consists of an arrangement of mechanism, to be applied to and used in conjunction with carpet looms, for the purpose of introducing and withdrawing the wires used in forming the terry loops.

The general number of such wires is two; but the patentees fit their looms with three or four, which are mounted in slides or carriers, actuated by levers, to which motion is given in a manner much the same as that adopted for working the picking sticks of the ordinary power-looms.

The wires are introduced from opposite sides alternately, and there are generally three in the loops at the time of the weft being beaten up.

Claim.—The apparatus or combination of parts to be added to and used in conjunction with looms, for the purpose of introducing and withdrawing terry wires as described.

WILLIAM ACKROYD, of Birkenshaw, near Leeds. *For improvements in the manufacture of yarns and fabrics where cotton, wool, and silk are employed.* Patent dated July 31, 1852.

The improvements relate to the manufacture of yarns composed of cotton and wool, and of wool and silk, and consist in combining these fabrics before or after the process of combing, and in spinning them together after they have passed through the usual preparing machinery. The proportion in which the fibres are mixed will, vary according to the peculiar effect required to be produced.

Claim.—The preparing cotton and wool, also wool and silk, by combining them together before or after combing, and causing the fibres so combined to be spun and woven into fabrics.

WILLIAM EDWARD NEWTON, of Chancery-lane, Middlesex, civil engineer. *For improvements in the construction of wheels for carriages.* (A communication.) Patent dated July 31, 1852.

In the improved wheels described under this patent, the nave is composed of cast metal, having sockets to receive the ends of the spokes, which are of wood, and are secured in their places by filling pieces or wedges, which again are prevented from moving by a ring or band which encircles the nave. The axle of the wheels is formed of equal size throughout its length, and the axle-box is held in its place between collars on the neck of the axle. The axle-box is formed in two parts, which are placed together so as to embrace the neck of the axle, and a chamber is formed in front, and closed by a screw-plug for containing the lubricating material. The wheel is secured in its place over the axle-box by bolts passing through a ring on the axle behind the inner collar for the axle-box, and the leakage or waste of oil in that direction is prevented by a leather ring or washer closely encircling the neck of the axle, and screwed up against the end of the axle-box.

Claims.—1. The method of securing the wooden spokes of a wheel in the cast metal nave by means of filling pieces, which being held in their places by a ring, collar, or other convenient contrivance, will prevent the spokes from moving in their sockets.

2. The combination of the improved construction of axle with the double axle-box,

having a chamber at one end to serve as a reservoir or receptacle for oil, whereby the axle is lubricated; and the method for securing the nave of the wheel on the axle, and for preventing the waste and escape of oil or other lubricating matter.

Specification Due, but not Enrolled.

Henry Wickens, of Carlton-chambers, Regent-street, Westminster, gentleman. *For improvements in obtaining motive power.* (A communication.) Patent dated July 31, 1852.

PROVISIONAL PROTECTIONS.

Dated January 12, 1853.

88. Frederick Lawrence and Alfred Lawrence. Improvements in sluices and lock-gates.

Dated January 15, 1853.

104. William Bailey. Improvements in the construction of certain parts of apparatus connected with railway signals, and in the mode or method of working the same.

Dated January 18, 1853.

122. Frederick George Underhay. Improvements in machinery for mowing or cutting corn and other crops.

Dated January 19, 1853.

129. William Vincent. Improvements in cocks or taps.

131. Joseph Rock Cooper. Improvements in fire-arms.

133. William Edward Newton. Improvements in lamps or lanterns. A communication.

135. Celestin Malo. Improvements in steam generators.

Dated January 20, 1853.

137. John Crabtree. Improvements in machinery for winding and doubling yarns.

138. Peter Rothwell Jackson. Improvements in the manufacture of hoops and tyres for railway wheels and other purposes.

139. John Whiteley Ward. Improvements in the manufacture of woven or textile fabrics.

140. Cornelius Ward. A new construction of the musical instrument designated the bassoon.

141. Cornelius Ward. Combining the musical instruments designated the drum and the cymbals in such manner as to make them as one instrument, which instrument he terms the "cymbal drum."

142. Richard Mountford Deeley. Improvements in the grates or furnaces used in the manufacture of glass.

143. Horace de Manara. Certain improvements and arrangements applicable to steam-boats and other navigable vessels, for the purpose of preventing sea sickness.

144. William Riddle. Improvements in ornamenting walls, ceilings, and other surfaces.

146. Augustus Thomas John Bullock. Improvements in taps and cocks.

147. William Williams. Improvements in refrigerating apparatus.

Dated January 21, 1853.

148. George Carter. Improvements in the construction of furnaces.

149. Eliezer Edwards. An improvement in the construction of knobs, handles, and other articles of glass, earthenware, and other vitreous and semi-vitreous substances, and in attaching the same to doors, drawers, and other articles.

150. John Addison. Keeping up a communication between the guards and engine-driver, and between the guards and passengers, by means of a lamp signal, which answers both for a day and night signal for a railway train.

151. Abraham Anton Meijsenheijm Knipsehaar. An illuminated night clock.

152. George Thornton. Certain improvements in propelling vessels.

153. James Middlemass. The application of a new material to the construction of portable houses and other buildings.

155. William Taylor. Improvements in the production and application of heated air.

156. Matthew Andrew. Certain improvements in fastenings for windows.

157. Alexander Prince. Improvements in the manufacture of articles of furniture and other articles of a useful and ornamental character, by the use and application of a certain vegetable production belonging to the family of the cactus plant, and in the mode of treating and preparing such vegetable production so as to render it available for the above purposes. A communication.

158. William Joseph Curtis. An invention for excavating or digging earth, and for carrying or delivering the soil.

159. Reuben Plant. Improvements in the construction of glass-house furnaces.

160. John Chubb and John Goater. Improvements in locks and latches.

Dated January 22, 1853.

161. Louis Jules Joseph Malegue. A certain colouring composition for dyeing tissues or stuffs of silk and cotton.

162. Benjamin Quinton. A new or improved fastening for brooches and other articles of jewellery and dress.

163. John Powell Matthew Myers. Improvements in the manufacture of artificial fuel.

164. William Sharples. Improvements applicable to apparatus used for marking or scoring at billiards and other games.

165. William Daniel Steevens. An improved mode of signalizing or conveying alarum and other signals between one part and another of a train of railway carriages.

166. George Fife. Improvements in safety lamps, which improvements, or parts thereof, are applicable to other lamps.

167. John Medworth and Lawrence Lee. Improvements in lithographic presses.

168. Joseph Paul. Improvements in machinery for making drains in land.

169. Peter Hubert Desvignes and Francis Xavier Kukla. Improvements in galvanic batteries.

170. Arthur Wellington Callen and Abraham Ripley. An improvement in the modes of giving and transmitting multiplying rotative motion to shafts and other revolving bodies.

Dated January 24, 1853.

171. Henry Brinsmead. An invention for reaping all kinds of corn.

172. Howard Ashton Holden, Edward Bull, and Alfred Knight. A new or improved method of communicating between the guard and driver of a railway train.

173. Benoit Perreyon. A new mode of fastening buttons to garments, and an improved button, and also in machinery for manufacturing the same.

174. David Clovis Knab. Improvements in the process of and apparatus for distilling certain vegetable and mineral matters, and also animal bones and flesh.

175. Donald Beatson. Improvements in the means of propelling ships and other floating vessels.

176. William Nairne. Improvements in dressing yarns for looms.
177. Charles Randolph and John Elder. Improvements in propelling vessels.
178. William Kendall. Improvements in the manufacture of boxes and similar articles, and in the machinery or apparatus to be employed therein.
179. John Henry Johnson. Improvements in aërial navigation, and in the machinery or apparatus connected therewith. A communication.
180. John Stevenson. Improvements in machinery for spinning flax and tow.
181. Andrew Edmund Brae. A method of communicating signals from one part of a railway train to another.

Dated January 25, 1853.

186. Freeman Roe. Improvements in paving roads and streets.
188. John Sangster. Improvements in umbrellas and parasols. A communication.
190. Joseph Wiggins. An improved cement for resisting moisture and damp.
192. Henry Habberley Price. Improvements in raising and forcing water and other fluids.

Dated January 26, 1853.

194. Theodore Dwight Davis. An improved valve for steam and gas engines.
198. Thomas Frederick Cashin and Joseph Stirk. A grinding machine.
200. John Henry Johnson. Improvements in the method of lubricating machinery, and in the mechanism or apparatus employed therein. A communication.
202. William Henry Moore. Improvements applicable to the construction of temporary dwellings.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 8th,* 1853.)

53. Thomas Brown Dalziel. Improvements in the treatment or manufacture of textile fabrics or materials.
56. John Finlay. Improvements in grates and fire-places, or apparatus for the generation of heat.
90. John Aspinall. Improvements in evaporating cane-juice and other liquids, and in apparatus for that purpose.
171. William James Lewis. A slideless stadia sight, applicable to rifles and other fire-arms.
181. William Edward Newton. Improvements in governors or regulators for regulating the pressure of gas as it passes from the main or other pipes to the burners. A communication.
231. George Walker Nicholson. Improvements in screw-bolts, nuts and washers, and in the machinery or apparatus for making the same.
234. John Balmforth, William Balmforth, and Thomas Balmforth. Improvements in steam boilers, and in fixing the same.
236. Robert Brown. An improved taking-up motion applicable to looms and other similar purposes.
252. Jacob Tilton Slade. An improved mode of driving certain machines, and an improved driving band or chain to be used therewith.
259. George Walker Nicholson. Improvements in vices, and in the means or method used for fixing the same.
262. Robert Mortimer Glover and John Cail. Improvements in miners' or safety lamps.
305. John Talbot Tyler. Improvements in hats, and in the preparation of plush or other covering used in the manufacture of hats.
341. Edward Simons. Improvements in lamps
361. Joseph Pimlott Oates. An improved spring or improved springs for carriages.
362. William Tatham. An improved mode or improved modes of preventing accidents on railways.
408. William James Matthias and Thomas Bailey. Improvements in clocks and watches.
435. John Goodman. An improved fountain pen.
455. Auguste Edouard Loradoux Bellford. Improvements in cocks or taps. A communication.
462. Jacob Tilton Slade. An improved hoisting apparatus.
538. Alfred Charles Hervier. An improvement in the application of centrifugal force to propelling on water.
828. Michael Leopold Parnell. An improvement in the construction of box staples and striking plates.
967. Richard Archibald Brooman. Improvements in saws and saw-mills. A communication.
1075. Charles Barlow. Improvements in bleaching, purifying, and concentrating sulphuric acid, parts of which invention are applicable to evaporating other liquids.
1189. Benjamin Glorney. Improvements in obtaining and applying motive power.
21. Jean Baptiste Pascal. Improvements in obtaining motive power.
64. Michael Fitch. Improvements in ovens.
69. Joseph Beattie. Certain improvements for economizing fuel in the generation and treating of steam.
74. Thomas Cottrill. Improvements in the manufacture of certain salts of soda.
88. Frederick Lawrence and Alfred Lawrence. Improvements in sluices and lock gates.
96. John Walker Wilkins. Improvements in electric telegraphs, and in the instruments used in connection therewith.
103. James Stewart Kincaid. Improvements in ascertaining and registering the number of persons entering or quitting omnibuses or other vehicles or vessels, which improvements are applicable, in whole or in part, to buildings or other places.
108. Peter Alexander Halkett. An improved construction of inkstand.
111. Thomas Cropper Ryley and Edward Evans. Certain improvements in the construction of wrought iron wheels, to be used upon railways or for other purposes, and in the machinery or apparatus connected therewith.
117. Henry Henson Henson and William Frederick Henson. Improvements in signalizing on railways, and in the apparatus used therein.
125. Peter Fairbairn and Samuel Renny Mathers. Certain improvements in machinery for drawing the sliver and rove of flax, hemp, and tow.
129. William Vincent. Improvements in cocks or taps.
131. Joseph Rock Cooper. Improvements in fire-arms.
139. John Whiteley Ward. Improvements in the manufacture of woven or textile fabrics.
144. William Riddle. Improvements in ornamenting walls, ceilings, and other surfaces.
153. James Middlemass. The application of a new material to the construction of portable houses and other buildings.
160. John Chubb and John Goater. Improvements in locks and latches.
174. David Clovis Knab. Improvements in the process of, and apparatus for, distilling certain vegetable and mineral matters, and also animal bones and flesh.
177, Charles Randolph and John Elder. Improvements in propelling vessels.
188. John Sangster. Improvements in umbrellas and parasols. A communication.

Opposition can be entered to the granting

of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS DEPOSITED.

209. Casimir Noël. A new regulating bit. January 28.

242. George Twigg and Arthur Lucas Silvester. Improvements in apparatus for cutting and affixing stamps and labels. Partly communication. January 29.

250. Walter Williams, jun. Improvements in machinery for cutting and shearing iron and other metals. January 31.

258. Thomas Charles Clarkson. Improvements in the manufacture of hats, caps, and bonnets, which improvements are also applicable to other articles of wearing apparel. January 31.

WEEKLY LIST OF PATENTS.

Sealed Feb. 7, 1853.

116. William Bolivar Davis.
403. Jeremiah Driver and John Wells.
450. George Heyes.
519. Mathew Fitzpatrick.
684. Thomas Dunn and William Watts, junior.
933. James Rothwell.
971. Frederick Mackellar Gooch.
1005. Emile Kopp and Frederick Albert Gatty.
1108. Juan Nepomuceno Adorno.

Sealed Feb. 9, 1853.

355. Peter Warren.
476. Samuel Marsh.
650. James Wotherspoon.
753. Robert Sandiford.
757. Thomas Taylor.
788. William Williams.
798. Jean Joseph Jules Pierrard.
826. Francis Bywater Frith.
850. William Henry Winchester.
963. William Pink.
935. James Edward M'Connell.
1069. Richard Taylor, junior, and John Arthur Phillips.
1070. Clement Dresser.
1087. George Sands Sidney.
1097. Joseph Matthews.
1100. William Robertson.
1115. William John Silver.
1116. George Gwynne and George Fergusson Wilson.
1136. Thomas Greenshields.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Feb. 9	3419	Henry and John Gardner	Strand	Fish-tail burners.
10	3420	Benjamin Sawdon	Huddersfield	Portable gas apparatus.
,,	3421	Dent, Allcroft, and Co.	Wood-street, Cheapside	The club-house cravat.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Feb. 9	492	Hyman Lewiston	Mary-street, Kingsland-road	Bib for infants, or chest-protector.

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No. 1541.] SATURDAY, FEBRUARY 19, 1853. [Price 3d. Stamped 4d.

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TIZARD'S PATENT MASHING ATTEMPERATOR.

TIZARD'S PATENT MASHING ATTEMPERATOR.

(Patent dated May 8, 1852. Specification enrolled November 8, 1852.)

THE intention of this contrivance is to enable the brewer to adjust with ease the temperature of the "mash" at every part of the process. In the accompanying figure is represented a vertical section of the apparatus, through the axis of the tun in which it is fixed; and this arrangement will be found to effect some important improvements on that which was patented by Mr. Tizard in April, 1841. The employment of this mash-tun admits also of the advantageous performance of several distinct operations for the conversion of grain and malt into saccharine and vinous liquors, to some of which we shall advert.

The apparatus shown in the figure is intended for a twelve-quarter mash-tun. *a a* are the mash-tun staves or sides. *b* is the permanent bottom; *c*, a perforated false-bottom, raised a few inches above the bottom *b*; *d d*, iron standards, carrying a cross-bar *e*; *f*, the central shaft of the "mashing attemperator"; *g*, a vertical rake-shaft, carried by the arms *k k*, projecting from the central shaft *f*, and furnished with the hollow rakes *h h*; *i i*, foot and packing-box of the central shaft; *l*, a circular rack bolted to the permanent bottom of the mash tun, and geared into by the pinion *m* on the vertical rake-shaft *g*. *n n* are brackets projecting from the central shaft *f*, which serve to support the thermometer *o*, by which the heat of the mashing liquor is indicated. *p* is a "sparger-cistern," and *q q* the arms of the sparger. *x* is a double delivery-pipe, by which the sparger-cistern is supplied with liquid. *r* is a bevel crown-wheel, on the central shaft *f*, which is geared into by the pinion *s* on the horizontal driving-shaft *t*, which works in the plummer-blocks *u u*. *v* and *w* are fast and loose pulleys on the driving-shaft *t*. *y* is a stopcock in the steam pipe which connects the steam boiler with the mashing apparatus. The arrows indicate the course taken by the steam or hot air employed in passing through the hollow portions of the apparatus.

This is the general form of the apparatus, as described in Mr. Tizard's former patent. We now proceed to state the improvements which he has since introduced, and the operations which he performs with it.

The rakes *h h* are perforated with any convenient number of holes, which are covered with spring valves 6, 6, 6, having rings 7, 7, 7, by which they are fastened down to the pipes so as to stop the holes. These rings are slotted, and slide freely on the exterior of the rakes. 8, 8 are stop-pins, behind which the slotted rings are moved when steam, atmospheric air, oxygen, or other fluid is injected into the mash. 10, 10 are dipping or inclining vanes attached to the rakes *h h*, so that when in motion a lifting or pumping effect is produced on the mash. 11 is a circular pipe, perforated on both sides, and fastened to the permanent bottom of the tun, beneath the false bottom. This pipe is in connection with other pipes and valve-boxes, afterwards described, and together with the perforated mashes, constitutes what the patentee denominates the "caloric injector." 12 and *y* are pipes connecting the apparatus with a steam-generator, or heater for air or fluids. 13^a and 13^b are valve-boxes containing spherical valves; the former in connection with the injection-pipe 12, and the latter with the draw-off pipe 18. 14 is a four-way branch-pipe, to which are attached the gravitating or draw-off wort-pipes 15, 15. The upper ends of these latter are in communication with the mash-tun, and covered at their open ends by the strainers 16, 16 on the interior of the tun. 17 is the exit-steam or air-pipe, which connects the masher with the valve-chest 13^b and exhaust-pipe 9. 18 and 19 are wort-drainage pipes, furnished with suitable cocks.

The operation of the apparatus is as follows:—As a preliminary step, all the valves, cocks, &c., are turned off, and the grist and liquor prepared for being introduced into the tun, after which the operator proceeds as follows:—*Operation No.* 1.—The masher being put in motion, and about one-fourth of the grist and the entire quantity of liquor poured into the mash-tun, the steam or hot-air cocks are turned on, and steam or hot air admitted to the hollow parts of the apparatus. The temperature of the mashing-liquor, instead of ranging from 160° to 180° Fahr., need not in this case exceed 100°; and the steam or hot air will be regulated so as to produce such a degree of heat. The steam or hot air passes through the masher in the direction shown by the arrows, lifting the valve 13^b, and making its exit through the perforations of the pipe 11, where it is partially condensed under the false bottom, and is ultimately absorbed by the mash. The whole of the grist having been mashed with from 1½ to 2½ barrels of liquor per quarter, and the temperature raised to a proper saccharizing point, which varies with the quality of the grist, and

ranges between 155° and 175° Fahr., the cock *y* is turned off, and the masher thrown out of gear. At the expiration of from one to three hours, the taps 18 and 19 are set open; when the worts will flow off equably from the mash through the perforated coil 11 into the under or boiling back; the sparger supplying the remainder of the liquor at the discretion of the brewer.

Among the advantages derived from this method of working, are the following:—First. The power of saturating and converting the malt at a very low temperature, without increasing the fluidity of the mash to an undesirable extent. Second. The equalization of the temperature of the mash, produced by the current which the masher causes to ascend during its revolution. Third. The preventing the finer particles of the grist from gravitating through, or settling on the perforated bottom, which is another result of the upward current in the tun. And, Fourth. The prevention of partial or unequal currents, by drawing off through the perforated coil of pipe.

Operation No. 2.—The masher having been put in motion, and the grist and liquor blended, the cocks 9, 12, and *y* are opened, and steam or hot air allowed to pass through the masher, and ultimately to waste. Steam or heated air from the generator (the inventor prefers hot air) is then passed into the mash through the valve-chest 13* and perforated coil 11, until the desired temperature is reached. All the advantages above named, as resulting from operation No. 1, are obtained also by this mode of working, and in a more expeditious manner, on account of the higher temperature employed for the fluids injected into the mash, and the superior oxydizing powers of hot air. The worts are drawn off through the perforated coil when the mashing operation is completed, as before described.

Operation No. 3.—In this process the steam or hot air is injected into the mash through the perforations in the revolving hollow rakes, or masher. When commencing to work, the spring valves 6, 6 are released by sliding back the rings 7, 7 behind the pins 8, 8. The grist and liquor having been thoroughly blended, and the mash allowed to remain quiescent for some time, the cock *y* is opened; and by this means the steam or hot air is injected into the mash through the perforations in the rakes, until the mash has acquired the desired temperature, and the saccharizing operation is completed, when the wort is drawn off as before through the perforated coil.

Operation No. 4.—The mash having been made with the smallest practicable quantity of liquor, and at the lowest temperature at which the operation can be conducted, with or without the aid of the masher; and having been allowed to remain quiescent for a period which may vary from ten to ninety minutes, at the discretion of the operator, the cocks 15, 15 are turned on, and also the cock 12. The worts will then flow from the surface of the mash through the strainers 16, 16, down the pipes 15, 15, ascend the four-way receiver 14, and rise through the perforated coil 11 into the mash. The ascent of the worts may be assisted and accelerated by injecting steam, hot air, or oxygen through the pipe 12, by which means also the mash will be heated to any required temperature, and the saccharine fermentation promoted. The worts are ultimately drawn off through the perforated coil, as in the foregoing operations.

THE PACIFIC SURVEYING EXPEDITION.

(From the *Times*.)

With our late advices from the Cape of Good Hope we have received intelligence of an interesting nature from the expedition which left England in the spring of the past year, for the purpose of making a lengthened survey of the Pacific, and conducting the various scientific operations connected therewith. The vessels selected for this important service were the *Herald* and *Torch*—the latter a steamer of small draught of water, and both under the command of Captain Henry Mangles Denham, R.N., F.R.S., an officer well known for his scientific attainments, and possessing, in an eminent degree, all the qualifications requisite for the superintendence of an undertaking of such importance.

Our information bears the date of December 9th, 1852, at which period the *Herald* and her steam tender were at Simon's Bay, Cape of Good Hope, making active preparations for proceeding further on their voyage of discovery. We select those portions of the letter before us which possess the greatest interest:—

"The satisfactory results which have attended our passage thus far, long as it has been, have not only obtained for us commendation, but also elicited a wish at head-quarters that our voyage should include the Cape of Good Hope. Such a detour, however, unavoidably protracts it still more. The fact of our having received instructions to obtain deep-sea soundings

at rapid intervals of time, necessarily checked our progress almost every hour, and was the means of the discovery of two ocean banks of coralline structure, extending some 80 miles separately, and suddenly jumping from 200 fathoms, with no bottom, to 19 fathoms, at a cast of the lead. We had determined that our magnetic observations should form a close link chain throughout each successive 24 hours. To fulfil this intention, our run between sunset and sunrise, however fair the wind might be, could not be more than 40 miles.

"In order to test the magnetic deviation of both vessels, at every anchorage they had to be swung, and the meridian distances, astronomically, of one place with another had to be determined. According to the tranquillity of the sea, our soundings were carried to the depth of 1,000 and 1,500 fathoms, the temperature at that depth being found to have decreased to 40°, though 90° at the surface. But be the depth of water however great, the temperature at the bottom, was never lower than 40°. By lowering down a white plate in a pitch kettle the sun's rays were traced to have penetrated the ocean to 66 fathoms. At last our soundings extended to the unprecedented cast of 8¾ miles depth, and our thermometer here brought up results from greater depths than were ever previously obtained. The great depth of 15,412 yards was obtained at a position about midway between Tristan d'Acunha and Cape Horn. We visited the island of Tristan twenty years ago, since which time no ship has touched there. On this occasion we had to correct the longitude many miles, and to prove that the magnetic variation was double that recorded. A survey of this island, and fixing the relative positions of the others called Nightingale and Inaccessible, occupied some time. Here we found eighty-one British Protestants isolated—a most interesting incident. We furnished them with gunpowder to blast stone, and tools to work it for a church and school-room, and replenished their books and necessaries.

"To effect the survey of the banks (one of which we have named Victoria) required many evolutions. The *Herald* was at anchor in the middle of the ocean at intervals during more than three weeks, to the utter astonishment of some ships whose tracks lay in the direction of our position. We were necessarily subject to the vicissitudes of a mid ocean anchorage, but we have not lost an anchor, spar, or sail, nor a man overboard during our peregrination thus far through a route of 10,000 miles. We have experienced a variety of phenomena of a most interesting nature, varied scenes, and climate. A fourth series of work is preparing for despatch by the packet of the 20th inst. Our refit, taking in provisions, &c., will be completed in a day or two, when we start for Sydney, expecting to eat our Christmas dinner near to the island of St. Paul and Amsterdam. The officers and crew perform their duties most cheerfully, and to the entire satisfaction of the commander of the expedition. When we arrive at the actual region of our survey we shall all be in excellent training."

[We have been favoured with the following letter on this subject from Captain Molyneux Shuldham, R.N., of Portishead, an officer who has, on several occasions, made some valuable contributions on nautical subjects]:

To the Editor of the Mechanics' Magazine.

SIR,—In consequence of the late articles published in the *Times* regarding deep-sea soundings, taken by Captain Denham, F.R.S., in the *Herald*, on her passage from Rio de Janeiro to the Cape of Good Hope, as stated by Mr. Weld, from a communication which the Royal Society had received from the Admiralty, I beg to intrude upon your columns by stating that, as far back as December, 1841, I submitted a plan to my Lords Commissioners of the Admiralty, for the purpose of sounding the oceans and deep seas of the world; but, as a vessel expressly fitted for the undertaking was absolutely required to make a practical beginning of it, their Lordships declined the proposal on account of the expense, although stating, at the same time, that it was very desirable, in many scientific points of view, to have the depths of the sea ascertained in all parts of the globe.

Another account in the *Times* mentions that Captain Denham succeeded in obtaining soundings to the great depth of nearly 8¾ miles, and that, soon afterwards, he sounded in 19 fathoms an extended coral bank; which clearly shows that there are very high submarine mountains, some of which may rise nearly up or to the surface of the sea, so that it is very probable that the accounts which so many captains of merchant vessels have from time to time related of their having discovered shoals and breakers (not laid down in any charts) may, after all, be correct, and that many vessels which have never been heard of, may have been wrecked upon them, which certainly gives great importance to the subject, and shows the necessity of our acquiring a knowledge of the conformation of the bottom of the sea. To map it, even imperfectly, would be impossible without much assiduity and some annual expense; and by all maritime nations

joining in the great work, with a determination to complete it in the course of time, much might be accomplished, if each would constantly employ a deep-sea steam or caloric sounding vessel expressly fitted for the purpose, and to do no other duty. The best practical plans would soon be devised to accomplish the purpose, and we should not hear of a sounding plummet occupying nearly 9½ hours in finding its way to the bottom, at a rate of less than one mile per hour, whereas six or eight, I think, might be obtained.

The great depths to be sounded shows the necessity of a large reel for winding up the line to be fitted in the hold of the surveying vessel, and that steam should be the power employed for that purpose, as quickly as it could be done without the risk of breaking the line.

In the year 1848 attempts were made in the Atlantic Ocean to gain soundings, but, unfortunately, a plan which was suggested, and thought to be a great improvement, viz., iron wire instead of a hempen line, completely marred the undertaking. The sounding-line which I had proposed would have been about the specific gravity of the water which it would have displaced, or only as much more as would be required to overcome the friction of the line at different depths—that is, it should descend with equal velocity at all depths, or, which amounts to the same thing, show equal strains, which, by experiment, might be easily ascertained by attaching the line at different depths to a spring steelyard. This, in my opinion, might be soon practically accomplished, or if not perfectly, it would be of little matter. It may be asked—How is the hempen line to be manufactured to the desired specific gravity? I should answer—As hemp is too light, I should have a fine copper wire of the desired weight twisted in one of its strands, and if, after sounding practice, I found the line too heavy or too light, I would cause to be inserted in the next sounding line which was manufactured a thicker or a thinner wire. It may be here remarked, that a hempen line at great depths would be so saturated as to be about the same specific gravity as sea-water. The greatest care was taken in Captain Denham's soundings to bring up the plummet or sounding weight; but, in my opinion, success was impossible; for when it touched the bottom, there must have been more than 1,000 atmospheric pressures upon its upper surface, while its lower one would be relieved from its equal hydrostatic one. Thus in deep-sea sounding all the sounding-weights would, I fear, have to be sacrificed, and no information could be given of the nature of the bottom. I could go on explaining how a deep-sea sounding vessel should be contrived for doing her work with the greatest speed, but I should then be taking up too much of the valuable space in your Magazine. I may do so hereafter, should Captain Denham's successful discovery occupy the attention of the maritime world.

I am, Sir, yours, &c.,

MOLYNEUX SHULDHAM.
Commander R.N.

Portishead, near Bristol,
Feb. 5, 1853.

PARNELL'S "MASTER-KEY DETACHMENT."

THIS instrument is an important supplementary adaptation to the "defiance-lock," invented by Mr. Parnell, of Little Queen-street, Holborn, by means of which a great ulterior purpose is accomplished in that highly ingenious contrivance. There are three principal points in the "defiance-lock" which deserve notice—the expanding bit of the key, the revolving curtain or cap, and the serrated notches in the "stump" and in the levers. First, with regard to the key. When this has moved through a given portion of its revolution,—about a quadrant,—it comes in contact with a "detector," or obstacle, which would arrest the farther progress of a false key. The true key passes the point by means of its expanding bit, which is a piece of hard steel, sliding outwards upon the ordinary bit. At this critical point of the course of the key, a steel cam-plate, or eccentric, at the base of the pin, comes into play. By the revolution of the key against this plate, the movable part of the bit is thrust outwards, and presses against the detector, enabling the key to pass the point, raise the levers, and shoot the bolt. In returning, the expanding bit is brought back by another arrangement equally simple. The revolving curtain is made of hardened brass. It revolves about the pin as a centre; and, therefore, with the key, and its upper-plate, is in accurate contact with the interior surface of the lock-plate. An aperture is provided for the key in this plate, and the cap extends around the side of this aperture downwards through the whole depth of the lock, forming a small chamber, within which the bit fits accurately; so much so, that the finest point cannot find access to the works. As the key moves, it carries the curtain with it, the solid part of which closes over the key-hole. With a false key, which a burglar would have infinite difficulty in admitting into the curtain, the curtain might be brought up to the de-

tector, and there the attempt would fail. The notches in the stump and in the levers take the strain off the levers, supposing an attempt could be made to force them by any extraordinary means, though these seem utterly excluded. There are other points worthy of notice in Parnell's lock; but we have stated enough to render the description of the master-key detachment comprehensible.

The intention of this contrivance is to enable the possessor of the master-key not only to open any number of locks of the same suit, where a variation of keys may be necessary, but also to throw them all "out" at pleasure; so that none of the ordinary keys can be of the slightest use until the master-key, by its insertion in the lock, puts it into working order for them again. In fact, it locks the lock even against the ordinary key, and acts as effectually as if that key had never been in the lock at all, thereby rendering it for the time useless. The mode by which this is effected is as follows:—At the end of the levers is a strong spring, having a bevelled angular catch on the upper end, with a small stud, about a quarter of an inch in diameter, projecting to the outside of one or both sides of a door, if desirable. On this catch one or more levers are made to fix quite independently of the working levers of the lock itself.

In a bank, prison, or other large establishment, where a number of keys are in use by various persons up to a certain hour, it often becomes desirable that the operation of these keys should cease. The only thing required for that purpose is, that the possessor of the master-key should push the stud on the outside of the door about the sixteenth of an inch on one side; by which means the extra lever or levers, which had hitherto rested on the spring catch, are instantly liberated, and falling downwards, take possession of the bolt. When it is required to put the bolts "in" again, it is only necessary to insert the master-key, turn it round about one-third of the unlocking movement, when the extra levers are lifted on the spring catch, where they remain as before, until it is wanted to detach them again.

THE NEW ARCTIC EXPEDITIONS.

The Riggers at Woolwich dockyard have commenced stripping the *Isabel*, the screw steam vessel, belonging to Lady Franklin, as it is intended to renovate her rigging so as to render her capable of performing a voyage to Behring's Strait. The work requisite to be done on board the *Isabel* will be accomplished with as much despatch as possible, as it is desirable to have her ready to leave Woolwich by the first week in March, to follow in the course of the *Rattlesnake*, Commander Trollope, also intended to proceed to Behring's Strait.

The *Phœnix* steam sloop, Commander Edward A. Inglefield, will be accompanied during the outward voyage to Beechey Island by a sailing vessel of about 800 tons, the Admiralty having advertised for a vessel of about that tonnage to be commanded by a merchant captain and merchant crew, the arrangement intended being that the sailing vessel is, immediately on arrival at Beechey Island, to deliver her cargo and return home during the same season. It is not yet finally decided, owing to the new arrangement of a vessel of 800 tons being employed to convey stores to the Arctic regions, whether the *Lady Franklin* or *Sophia*, the sailing vessels of Captain Penny's expedition, and at present idle at Chatham, will be again employed in the expedition of 1853; but as these vessels are only about 190 tons each, they would be most desirable auxiliaries in the event of its being found necessary to send either or both up the Wellington Channel after Captain Sir Edward Belcher's expedition, especially as a vessel of 800 tons would not be suitable in the event of her services being required for that purpose, owing to her great draught of water. The *Lady Franklin* and the *Sophia*, manned by officers and seamen of the Royal Navy, and placed under the command of Edward A. Inglefield, with the rank of Captain, would, or at least one of them, be subsequently available to proceed up Smith's or Jones's Sounds, or arms of the great expanse of water which was seen by Commander Inglefield, during his voyage up the former sound last year, and enable him to decide to what extent the open water would be found in that high latitude, and where it led to.

Receipt for Joining Glass.—Melt a little isinglass in spirits of wine, and add a small quantity of water. Warm the mixture gently over a moderate fire. When mixed by thoroughly melting, it will form glue perfectly transparent, and which will reunite broken glass so nicely and firmly that the joining will scarcely be perceptible to the most critical eye. Lime mixed with the white of an egg forms a very strong cement for glass, porcelain, &c.; but it must be done neatly, as, when hard, the superfluous part cannot easily be smoothed down or taken off.—*Scientific American.*

THE TRADES OF BIRMINGHAM.

The manufacturers of this town and of the surrounding country still continue in full activity. The Wolverhampton and Willenhall trades are in a highly satisfactory condition, considering the high prices of all raw material. At Dudley, Westbromwich, and throughout what is termed the "black country," the puddlers, miners, and others are working over time, and at Smethwick great activity prevails in the various departments of manufacture. At the extensive works of Messrs. Fox, Henderson, and Co., about 1,000 hands are now employed in addition to about 2,000 others engaged working at a distance, completing contracts entered into by this celebrated firm. The average weekly consumption of iron at these premises is upwards of 1,000 tons, and the quantity of manufactured work completed daily amounts to 100 tons. The men are chiefly occupied with the iron work for the Crystal Palace, which is being completed with great rapidity, and forwarded to Sydenham. The iron castings for the Paddington terminus are also being made here, and considerable additions to the original contract have been decided upon. This firm are now also actively engaged in making the Zealand railway from Roeskilde to Koersoer, in Denmark, for which they contracted some time ago. Workmen and competent foremen have been sent out, and the materials for the construction of the line, which is 55 miles in length, are being made with great rapidity and forwarded to Denmark. A contract for gasometers and other work entered into some short time ago, and intended to light the City of Lima, is nearly completed, and will speedily be forwarded to their destination. The iron-work for the Great Central Birmingham Station is also being turned out rapidly, and several large ribs have lately been forwarded to New-street, and erected. Some large orders for railway carriage and wagon wheels are also being completed.

At the Smethwick Tube-works, Messrs. Asbroy's casting-works, and Beasley's iron-works, the greatest activity prevails. Some new works are now in course of erection, where it is intended to manufacture hooks-and-eyes, and other small articles; and it is calculated that 500 people will be employed. This branch of manufacture in Birmingham is now in a highly prosperous condition; and though the profits are small, owing to extraordinary competition, the unusually large demands render increased speculation profitable. One firm in this town now completes and ships to various parts 20 tons per week, exclusive of large numbers made for home use.

In connection with the trade of this district, the state of the potteries may not be undeserving notice. In consequence of the high price of coal, and the rise of wages, the manufacturers have been obliged to raise the price of china and earthenware; and at a meeting held on Tuesday, which lasted eight hours, it was resolved that an advance of 10 per cent. is applicable to all descriptions of goods, china, and earthenware; and that the foreign list of 1853 will, in future, be the guide of the trade. New lists for the home trade are in course of preparation, and will be forwarded to the trade in London, and all other large towns interested in these transactions. It was stated at the above meeting that the advance in the price of coal alone has made a difference of from 600*l.* to 1,000*l.* per annum to some of the large houses, and proves the necessity for the proposed advance on manufactured goods.

There has not been any additional advance on the price of copper declared since my last letter announcing a rise of 18*l.* 10*s.* per ton; but orders will not be accepted by the smelters and dealers at 129*l.* for best selected, and the warehouses at this price continue empty.

The tin trade is still in the same unfavourable position. There are abundant orders on the books for manufactured goods; but tin cannot be procured here, even at the recent enormous advances. This scarcity, which will soon have the effect of closing some of the largest manufactories, is the result of monopoly. There can hardly be found one hundred weight of tin in the Birmingham warehouses, whilst large stocks are pretty well known to be in the hands of London dealers, who are exercising a ruinous monopoly, to the very serious injury of our manufacturers and mechanics.

The exportation of Birmingham hardware to Australia is, according to all accounts, greatly on the increase. Guns and pistols continue in great demand; but perhaps of all orders, except those for these weapons of offence and defence, which best indicate the state of society in the country for which they are destined, is an immense order now in course of execution in Birmingham for handcuffs and leg-irons! A large quantity have already been shipped for Melbourne, and a still larger number will be exported in the course of the present and next week.

THE IRON TRADE.

Birmingham.—The iron trade remains, as last reported, in full activity; and prices, by the leading houses, are firmly maintained. Out of 159 furnaces in South Staffordshire,

there are now 127 in blast, and new ones are in course of erection. Good ironstone fetches from 20s. to 22s. per ton; and in the neighbourhood of Dudley, where the royalty is fixed regardless of the selling price at about 2s. per ton, masters are realising a large profit. It is said that some parties who have had large contracts to execute at prices agreed upon before the advance took place, can purchase iron under the quotations of the last quarter, and so far there is a tendency to give way.

Some extensive orders have, within the last month, been received from America for railway iron; and contracts, it is expected, will be entered into for about ten thousand tons for the same market, within the next fortnight. The rails to be made to the above order will differ materially in construction to those used on our railroads. The rail, in place of being made in the solid form, will be made in two equal parts; and when laid down will be put together by means of screws or strong rivets, and will, it is said, fully answer the purposes intended. There is also to be a great improvement in the joints of the rails, so that each will fit tightly, and cannot possibly be displaced by any weight; and the metals, when laid, will present the appearance of solid lines, without any divisions whatever.

Glasgow Pig Iron-Market.—Glasgow, Feb. 12.—During the past week, the market for pig-iron has been languid, and prices have gradually given way, closing at the lowest point; viz., 53s. 6d. cash for warrants, at which there were sellers to-day without buyers. No. 1, g. m. b., may be quoted at 54s. 6d.; No. 3, 54s.; No. 1, Gartsherrie, 56s., cash, against bills of lading.

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair.

The paper read was "On the Use of Heated Air as a Motive Power," by Mr. Benjamin Cheverton.

The author, in a short historical notice, stated that Sir George Cayley had written on the subject in 1804 and 1807, and had subsequently built several engines; but that the Messrs. Stirling, of Scotland, produced the first really efficient engine, working by means of heated air, in the year 1827; in the same year Messrs. Parkinson and Crosley brought forward their Air Engine; that Mr. Ericsson, following more closely the arrangements and form of the ordinary steam engine, constructed an air or a "Caloric Engine," as it was termed, in 1833;—Messrs. Stirling patented further improvements in 1840, and in 1845 their engine was described to and discussed at the Institution of Civil Engineers; — in 1851, Mr. Ericsson brought forward his present form of engine;—and that the principle acted upon in both these latter inventions, and announced as an important discovery in motive mechanics, was the reiterated use of the same caloric, in the production of power. The mechanical means of realizing this idea were described, and it appeared that in both inventions they were substantially identical. The ejected hot air, by being brought into contact with an extensive metallic surface of wire gauze, was deprived of its heat, which the next moment was imparted to the incoming cold air, and thus the ultimate use of the furnace was only to supply the unavoidable waste of caloric by radiation.

This view of the subject was strongly contested, as being inconsistent with the best established laws of nature, and as involving the idea of the possibility of the creation of power. It was argued at some length, that the employment of caloric as a motive agent consisted in the development, from molecular forces, of a dynamic force, and as such was directly amenable to the third law of motion—that of action and reaction being equal and opposite. It was contended that sensible caloric was not an indication of the presence, but of the abeyance of mechanical action; that these were interchangeably convertible quantities; and consequently, that a working force could appear only as heat disappeared—a conclusion entirely opposed to the assumed principle of the "Caloric Engine," that "caloric could be made to operate over and over again." It was admitted, however, that there was an apparent anomaly in the application of the law of action and reaction, when caloric was in question, in the fact that its quantity was not less after than before the generation of steam power, if it were estimated conjointly by water and temperature. But it was explained that a cause might have two classes of effects, and might require two distinct and different measures, to indicate its entire efficiency; that while caloric might remain intact, under the aspect adverted to, it lost by a declination in the intensity of its temperature, for which the equivalent gain was a dynamic force—a conclusion as adverse as before to the idea that such force could be acquired without cost. It was, in short, in the aspect of a *vis viva* "force" in caloric, that the development of mechanical action must be considered. These views were further explained and illustrated by a reference to the

analogous difference between momentum and the more practical modification of power, named by Smeaton and Watt, "mechanical power," "work," and "duty;" and it was shown that here also an apparent discrepancy existed in relation to the third law of motion, but which was cleared up when both the measures of power—that by time and that by space—were appropriately used.

It was contended, that the "Caloric Engine" was analogous to a non-expansive high pressure steam engine, which it would exceed in wastefulness of heat, if it were not provided with what its inventor improperly termed, a "Regenerator;" the office of which, it was insisted, was simply to absorb the unutilized sensible caloric of the escaping air, which, as compared with steam, was in very large proportion to the efficient caloric; and to afford another opportunity for its being converted into force, thus compensating for the loss of expansive pressure. An explanation, founded on these considerations, was given of the continued action of the engine, for some time after the fire was withdrawn—a fact which had been advanced in support of what was styled, the untenable hypothesis of a "regenerator of force."

Although the mechanical effect of heat might be proved to be independent of the chemical condition, if not, also, of the physical constitution of bodies, it was admitted, that economy of fuel, as being a distinct question from that of economising the caloric already in possession, was eminently a practical matter, only to be determined by experiment; and in this point of view it was explained, in what manner the reception of heat, at a much higher temperature than steam, was greatly in favour of air as a motive agent, but, on the other hand, many adverse considerations were adduced, tending to show the impracticability of the system, in its present form.

In conclusion, it was shown, that the "Caloric Engine" did not rest on true principles, exclusively its own — that its merits stood upon common ground with those of the steam engine—and therefore, that even should the performances of air be found superior to those of steam, it could not be anticipated that the former would immediately supersede the latter; but, as far as public statements could be relied on, the performances of the air engine on board the "caloric ship," *Ericsson*, were very unfavourable to the pretensions of the promulgators of the plan.

The discussion was commenced by an exposition of the several systems adopted by Sir. G. Cayley, Stirling, Parkinson, and Crossley and Ericsson, illustrating them by diagrams; whence it appeared, that the most preferable mode of heating the air was that of Sir G. Cayley, by directly traversing the incandescent fuel; that the great improvement recently introduced by Ericsson, was the wire gauze regenerator, which however formed an integral part of Stirling's original design. The practical difficulties of the immense dimensions of the heating vessels and cylinders, and the rapid destruction of the metallic parts, were fully considered; and it was admitted, that although, at present, there did not appear to be any positive recorded results, more advantageous than by the use of steam, it would be wrong to discourage the attempt to use heated air, and to overcome the inherent difficulties of the system.

Allusion was made to the appendix to a tract, published by Mr. A. Gordon, wherein it was shown, that the volume of the gases into which one cubic foot of anthracite coal was decomposed, under atmospheric pressure, was 219,250 cubic feet, that the volume of air required to sustain combustion was 14,273 feet; the mechanical power developed was 473,000,000 lbs., raised one foot. It was proposed by Mr. Maxwell Lefroy to pass these gases through water, in order to purify them from grit, &c., and to cool them to a convenient temperature, and then to use them together with steam, in power cylinders. He proposed a system of co-axial cylinders, of which the central one was the furnace, the two next were cylindrical shell-boilers, the water in the inner one of which completely covered the surface of the furnace—that in the outer one having its surface always below the insertion of the gas pipes in the furnace; the exterior sheels being for the purpose of gradually heating the air, in its passage to the furnace, so that the exterior shell, which alone sustained the bursting pressure, was always cool.

About one-seventeenth part of the power produced would be expended, in forcing in the air required to sustain the combustion of the fuel. The coal-hopper was co-axial with the furnace, and was kept cool by the supply water descending through its hollow shell into the interior.

The system would be one of high pressure; and some of its advantages were assumed to be, the absence of a funnel — saving three-fourths of the fuel, safety from explosion, with economy of first cost, space, and labour.

The discussion of the Paper was adjourned until the Meeting of Tuesday, February 22nd, when it was announced that the whole of the evening would be devoted to the subject.

SOCIETY OF ARTS.

The tenth ordinary meeting of the Society was held on Wednesday, the 16th inst., W. Tooke, Esq., F.R.S., Vice-President, in the Chair.

Mr. J. Sparkes Hall read a paper "On the History and Manufacture of Boots and Shoes," in which he gave an elaborate account of that article of costume from the earliest period to the present time, illustrating his remarks by reference to a large collection of specimens and diagrams, many of the latter being taken from Egyptian and other remains at the British Museum. Mr. Hall gave a most interesting extract from an essay on boots, and shoes, and slippers, written by Professor Camper, of Leyden, about a hundred years ago, and then came to the practical part of the question,—the boots and shoes of the present day, and how they were produced. Boots were preferable, he said, to shoes, as they gave greater support to the feet and ankles. The inconvenience of lace and button boots was then referred to, and the substitution of elastic web sides, introduced by Mr. Hall about twenty years ago, was thought to be preferable. Some difficulties were at first encountered in getting a web which should be at all times and seasons perfectly elastic and pliable, and should return to its normal state on the removal of strain. This had been attempted with spiral wire, and with the ordinary India-rubber, but it was found that the one was too rigid, and that the other, on a cold day, lost all its elastic properties. After a series of experiments, and the introduction of vulcanized India-rubber, the exact elasticity required was obtained.

The Secretary announced that a paper by Professor Jack, of King's College, Fredericton, New Brunswick, "On Uniformity in Weights, Measures, and Moneys," which had been communicated by His Grace the Duke of Newcastle, Her Majesty's Secretary of State for the Colonies, would be read at the meeting of Wednesday, February 23rd.

THE COTTON MANUFACTURE.

On Monday evening, Mr. Frederick Warren, of Manchester, delivered the first of a course of lectures at the Society of Arts, "On the History, Trade, and Manufacture of Cotton." This lecture was devoted to a consideration of the natural history of the cotton-plant, and of the countries in which it flourishes, the different varieties of long and short staple, and their peculiar uses being carefully described. The saw gin, and its various modifications for freeing the fibre of the seeds found with it in the pod, was next explained. Mr. Warren then referred to the condition of the people in cotton-growing countries, and showed, by well-arranged statistics, how the increase of our trade with America, in this article, had been the direct cause of a gradual extension of slavery, and had tended to raise the money value of the slave. There were but two ways, he said, in which England could put a stop to that abominable system; and, looking at it simply in a commercial spirit, he believed it was her interest to do so. The first was, to purchase the whole of the slaves and give them their liberty,—as was done in the case of our own colonies; and the other was to encourage the growth of cotton in British India, which had been shown to be capable of producing as good qualities and as great varieties of cotton as any other part of the world. In India, too, British subjects would be employed as free cultivators—the cost of which would not exceed, if indeed it came up to, one-sixth of the cost of slave labour. There were many reasons, obvious to any one who thought on the subject, why it was advisable that we should not depend so completely on America for our increasing requirements. There was never much more than two months' supply on hand, and already on several occasions this supply had been jeopardized; sometimes by natural causes, as the failure of the crops; at others by the attempt at monopoly on the part of American speculators, which had obliged us to pay a higher price, amounting in one instance to between four and five millions in the year. When it was considered that two millions of our people were dependent for their daily bread on this trade, it became of the utmost importance that we should take every means in our power to prevent anything like an impediment arising to the regular and uninterrupted supply of so important a commodity.

PARHELIA.

The following accounts of Parhelia, or mock suns, observed in Northamptonshire and Huntingdonshire, on the 14th and 15th instant, are given in letters to the Editor of the *Times:*

To the Editor of the Times.

Sir,—At twelve o'clock this morning, when returning from skating with a friend, I perceived on either side of the sun two parhelia, or mock suns; these were in their usual places, in two intersections of the halo. In each parhelion the colours were prismatic. Higher in the heavens, touching

the halo, was an arc of an inverted rainbow; and still higher, with the prismatic colours much more vivid, was another inverted arc. These two inverted arcs were as distinct in colours as the common rainbow, but not of the same breadth. There were various other circles not well defined. Verging towards the north was a third parhelion, not consisting of prismatic colours, and in which we could not trace the intersecting circles distinctly. The clouds in the north were at the same time tinged with red. The parhelia lasted more than an hour. I enclose a plan of that which was most distinctly seen. This appearance, well known to be common in Polar regions, is not very common in England. I find that on the 28th of August, 1698, three mock suns were seen at Sudbury, in Suffolk, at eight o'clock in the morning; and at Lyndon, in the county of Rutland, on the 22nd of October, 1721, parhelia were seen at eleven o'clock in the morning.

I am, yours truly,
EMERIC S. BERKELEY.

King's Cliffe, Wandsford, Northamptonshire,
February 15.

Sir,—About a quarter-past twelve P.M. this day, my attention was called by Mr. Valentine Hill, agent to his Grace the Duke of Manchester, to a beautiful appearance of four parhelia, situated at different points of a great circle of bright light, parallel with the horizon and passing through the sun. The angle formed by this ring with the horizon was apparently 25 deg. 20 min. Around the sun was a vertical circle of white light, in breadth about one-third of the diameter of the sun, and at the intersection of this circle with the horizontal one the two most southerly parhelia were situated; these were very brilliant, of a fawn-colour towards the sun, and of a violet-white on the more remote side; the two more northerly parhelia were much fainter, and disappeared before their angles could be taken. There was at the same time in the zenith a beautiful circular ring, not very distinct towards the north, but showing brilliant prismatic colours towards the south. The diameter of this ring, which was horizontal, was apparently the same as that of the vertical circle in which the two most southerly parhelia were situated. From further observations taken by Mr. Hill at 2h. 45m. P.M., the angle between the parhelia was 48 deg. 20 min. At the same time the angle between the sun and the nearest point of the prismatic ring in the zenith was 47 deg. Not having a *Nautical Almanack* at hand, I am not able to ascertain whether this observation confirms the supposition that the diameter of the prismatic ring and of the vertical circle was the same. The air has been very keen during the day, and at ten this morning the thermometer stood at 28 deg. F. (in the house), while yesterday in the open air it was as low as 24 deg. This phenomenon bears considerable resemblance to the one recorded by Scheiner in 1630.

I am, Sir, &c.,
JOHN THORNTON.

Grammar-school, Kimbolton, Hunts,
February 14.

WORKING OF COAL-MEASURES IN SOUTH AUSTRALIA.

AT length we may enjoy the prospect of a development of the mineral wealth of our South Australian colonies in a new direction. Having for some time past run almost exclusively on the production of gold, the determination to work the rich coal-measures of this singular country is a circumstance upon which our colonial and our home interests may congratulate themselves. The undertaking has assumed the practical form of a commercial company, formed for prosecuting it, under the style and title of "The Australasian Coal Mining Company." It is needless to point out the advantages for navigation, and local manufacturing purposes; this would necessarily result from coal mining in Australia. Steam navigation being now established with that colony, the facility that would be thus afforded for obtaining coal for the return voyage in the colony itself must be considered as of the highest importance; while the high character of the Directors of the Company, and those of the officers connected with it, insure the proper working of the undertaking. Altogether, we look upon the Australasian Coal Mining Company as one of national importance, and as such heartily desire that its operations may prove abundantly successful.

THE CONICAL FLOUR-MILL.

SIR,—I have just read a most interesting account of the performance of the conical flour-mill, on the principle of Westrup's patent, in your Magazine of last Saturday. The advantages of this arrangement are so manifest, that the inventor deserves the grateful congratulations of all classes.

It is doubtless known to Mr. Westrup, and does not at all derogate from the merit of his invention, that a part of the principle was known to the ancient Romans. Referring to my sketch-books, I find drawings

of several mills of the conical form, the chief difference between which and the patent mill is, that the bottom stone was fixed and the top one revolved. The advantage gained by Mr. Westrup, of liberating the flour from the mill without needless and injurious retrituration, belonged also to the ancient form. I send you a copy of one of my drawings, done *in situ*, of one of these ancient mills in Pompeii, and also of the lower stone, from which the top one has been removed. Two square holes in the upper stone—one on each side—indicate that two short capstan-bars were used to turn it, most probably by running round. Two persons were required to work these mills: they illustrate the passage, Luke xvii. 35—"Two women shall be grinding together."

I am, Sir, yours, &c.,

E. L. BERTHON.

Fareham, Feb. 14, 1853.

The Practical Draughtsman's Book of Industrial Design, forming a complete course of Mechanical, Engineering, and Architectural Drawing. Translated from the French, with Additions, by WILLIAM JOHNSON, A.I.C.E., Editor of the "*Practical Mechanics' Journal.*" Longman and Co.

THIS is the first part of an elegant and highly useful work, for which a want has long been felt in our educational appliances, and which promises to give an increased impetus to the cultivation of every art in which elegance or precision of form is an essential element. In almost every walk of decorative art, it is well known how much remains to be done in inculcating a just appreciation of the principles of beauty; and though in those of construction we may be said to have more generally correct ideas of figure, the relative proportion of parts, and their effective representation, it cannot be doubted that all would be largely promoted by assisting in developing the art of the draughtsman, which, in innumerable instances, has been the means of enabling an idea to be realized, which otherwise would not have escaped from the uncertainty and imperfect conception which surrounded it.

To the promotion of this great object in a popular form, rendering its pursuit easy by a judicious exposition of those geometrical principles only which are needed in practice, and holding out a strong temptation to the student to proceed, by enabling him to apply his knowledge, as soon as acquired, in producing some of the most elegant designs, the work before us is entirely devoted. Apart from its literary and illustrative merits, which are of the highest order, it comes before the artistic public under auspices which assure us at once of the ability with which its system of instruction is carried out, and its practical utility in the arts and manufactures. The original work, in the French language, was edited by M. Armengaud, Professor of Design in the

Conservatoire des Arts et Métiers, at Paris, and M.M. Armengaud, jun., and Amouroux, Engineers. Its compilation is remarkable for nothing so much as the admirable arrangement of its studies—the fewness of their number, their ease of gradation, and the importance of their application in the liberal or the useful of the arts of life. It has accordingly earned a wide popularity on the other side of the Channel, and it is fortunate that in England it has been ushered into existence by one who, having observed the wants of English designers and draughtsmen in attaining a perfect knowledge of their art, possesses the happy talent of administering to them with ease and success.

The plan of the work is extremely comprehensive, embracing every detail of instrumental drawing, perspective, shading, projecting shadows, colouring, and general management. These are distributed under nine divisions, the succession of which form a properly graduated course of study. The first division relates to linear drawing only, exhibiting the combinations of the straight line and circle, and those of a few other curves used in the arts. Abundant examples are furnished of the delineation of mouldings, ceilings, floors, balconies, cupids, rosettes, and other figures. In the second division, the very important subject of projections will be treated; and in the third, the conventional tints and colours appropriate for the expression of sectional details. The fourth division will include the construction of spirals, or helices, and also the intersection of surfaces, with numerous applications in various arts. Curves required in the representation of the teeth of spur-wheels, screws, and racks, and the details of the construction of their patterns, forms the subject of the fifth division; while the corresponding parts in bevel, conical, or angular wheels are treated of in the sixth. The seventh division is devoted to the projection and treatment of shadows, with numerous examples of their application. In the eighth, the student will proceed at once to figures of great complexity, representing combined or general elevations, and sections of machinery. The ninth division, completing the whole of this valuable course, is mainly devoted to perspective, with numerous applications in the arts, and tables of the dimensions of the principal details of machinery, to facilitate the actual business of construction.

Linear drawing, the subject of the first division, is illustrated in this division by four large and well-engraved sheets of diagrams, showing the more important geometrical operations, and the method of their execution by the best instruments, then giving examples of the mode of forming the outlines of elegant figures, architectural and otherwise; and, lastly, showing the same objects in their finished state, as they would be turned out of hand by the skilled draughtsman. A profusion of examples of designs, all graduating from the easy to the complicated, are given in the plates; and include inlaid pavements, ceilings, balconies, sweeps, sections, mouldings, gothic forms, conic sections, and volutes. Another plate is added, the first of a series of completed drawings of machinery. The example given in the present part is Siemen's Patent Balance Water-Meter, the execution of which is exceedingly good.

We have only to add, that the work is to be completed in twelve monthly parts, that its price is extremely moderate, and that the paper, typography, and general appearance leave nothing to desire.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING FEBRUARY 17, 1853.

Samuel Starkey, of Clapton, Middlesex, gentleman. *For improvements in machinery for washing minerals and separating them from other substances.* Patent dated July 31, 1852.

Mr. Starkey describes several washing-machines for separating particles of gold or other metal from the earthy or other substances with which they are found mixed; they are all, however, distinguished by the same principle of construction and operation.

The matters to be washed are placed in a horizontal sieve suspended over a semicylindrical vessel or trough containing water, which is dashed up against the matters on the sieve by arms or blades projecting from a horizontal shaft revolving in the trough. The arms are made of such length as just to touch the sieve in their revolution, and thus to produce in it a shaking motion, which facilitates the operation. The small particles of gold or metal and the earthy matters pass into the trough, leaving the stones and larger grains of metal on the sieve, from which they can be removed by hand. The water charged with earthy matter is allowed to remain at rest for a time, in order that the gold may subside, and a portion of the water is then run off through a valve in the end of the trough, and after allowing further time for subsidence another portion is allowed to escape

through a lower valve, and so on till the trough is emptied. The matters remaining in the trough are then collected and subjected to a final washing, in order to thoroughly cleanse the gold from any earthy admixture that may still be combined with it.

Claim.—The machines for washing and separating metals from other substances as described and shown.

WILLIAM HETHERINGTON, of Handsworth, near Birmingham, gentleman. *For improved machinery for stamping or shaping metals.* (A communication.) Patent dated August 3, 1852.

This invention relates to machinery used for stamping circular and other shaped vessels, and articles from sheets or plates of metal, by means of dies and pressure. The patentee describes an arrangement for this purpose, in which the lower die, whereon the sheet of metal is laid, is made a fixture, and the upper die or stamp, by which the metal is forced into the lower die, is formed in two parts; an annular part surrounding the central one and coming into action before it, so as either to force the metal partially into the lower die or to press it upon the upper surface of that die; whilst the central upper die either completes or wholly performs the shaping operation. The upper dies are both worked by cams; the central one is lifted by its cams, and allowed to fall on the surface of the metal, its descent being aided by the pressure of steam in a small cylinder fixed in the upper part of the framing of the machine, and having its piston-rod in connection with that die; whilst the annular die has a slow descending motion at first, and is afterwards held down so as to compress the metal between its surface and that of the lower die, and by this pressure on the metal to prevent the formation of wrinkles or creases, when by the action of the central upper die the metal is drawn between the pressing surfaces and forced into the form of the lower die.

Claim.—The stamping, pressing, or otherwise shaping of sheets or plates of metal in dies, by pressing the portions of the said sheets or plates situated near their circumference between two surfaces during the descent of the stamp or upper die, so as to cause the said pressed portions to be drawn between the said pressing surfaces during the formation of the vessel or other article, and thus prevent the formation of wrinkles or creases.

ROGER HIND, of Warrington, engineer. *For certain improvements in the construction of machinery or apparatus applicable to weighing-machines, weigh-bridges, railway turntables, cranes, and other similar apparatus.* Patent dated August 7, 1852.

Claims.—1. Three improved forms or constructions of indicators for weighing-machines, weigh-bridges, weighing turntables, weighing cranes, weighing steelyards, or troves, and other similar apparatus. (All these indicators are applied to machinery on the steelyard plan. The first form has the steelyard graduated on the upper edge, and provided with a suitable travelling weight attached to the main carriage for indicating tons; a second carriage and weight graduated for cwts. and qrs. runs on the main carriage; while the lbs. are indicated by a graduated horizontal rod, with sliding weight attached to the main carriage. The second form of indicator shows the weight of the article in tons by the graduations on the steelyard edge, whilst the cwts. and qrs. are indicated on graduated dials, set in motion by means of pinions, which are caused to revolve when the carriage is shifted along the steelyard by working into a rack formed on its under edge. The teeth of the pinions are so calculated as to give to the dials the velocity requisite to produce a correct indication. The third form of indicator is a modification of the second.)

2. An improved construction of double framing for weigh-bridges, or similar apparatus. (The double framing is adopted in order to prevent the access of rain, dust, or dirt to the knife edges of the apparatus.)

3. An apparatus for raising and lowering the weighing apparatus when required, by means of slide-rods, or an internal column or standard fitted into the main column or standard whereby the steelyard is supported.

4. A novel form or construction of weighing-machine for adjusting the weight upon the springs of locomotive engines, tenders, or railway carriages or wagons, having a separate and distinct table and weighing apparatus for each wheel of the engine, tender, or carriage, whatever the number of wheels may be.

5. A novel and peculiar construction of weighing crabs or cranes, having two or more levers placed beneath, and bearing the weight directly on them, whereby stays or supporting links are dispensed with.

6. An improved construction of weighing turntable, and especially the construction of the rollers and roller-race (in such manner that the axes of the roller bear against the race, whilst their peripheries support the platform of the turntable, by which arrangement friction is much reduced).

ALEXANDER MILLS DIX, of Salford, Lancaster, brewer. *For certain improvements in artificial illumination, and in the apparatus connected therewith, which improvements are also applicable to heating and other similar purposes.* Patent dated August 7, 1852.

The nature of this invention is clearly explained by the claims, which are for,

1. The novel and improved method of lighting and heating apartments and other places by burning gas or other combustibles in a close vessel or chamber (transparent or otherwise, as desired), to which atmospheric air is supplied by a tube or tubes, and from which the exhausted or foul air is conveyed by means of a tube or tubes, the said tubes not being in communication with the atmosphere of the room or other place to be lighted or heated.

2. The application of a current of water or other fluid to the exterior of the foul or exhausted air-tube or tubes, for the purpose of absorbing any desirable amount of heat therefrom.

Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. *For improvements in the manufacture of metallic fences, which improvements are also applicable to the manufacture of verandahs, to truss-frames for bridges, and to other analogous manufactures.* (A communication.) Patent dated August 7, 1852.

These improvements consist in substituting for the bolts or screws and nuts, or other fastenings used in connecting together the meeting portions of the metal rods or wires used in forming fences and similar structures, metallic ties, produced by casting molten metal around the parts to be united together.

The casting is preferred to be done in metal moulds, which may have any ornamental form given to their interior, and which are formed in two parts, in order that they may hold the meeting portions of the metal rods in position whilst the molten metal is being run in about them.

Claims.—1. The manufacture of metallic fences, verandahs, truss-frames, and other like structures, by uniting together the several portions of wrought-iron which go to form such structures by the application thereto of molten metal.

2. The employment in the manufacture of metallic fences, verandahs, truss-frames, and other like structures, of metal moulds so constructed as to hold the portions of wrought-iron which go to form the said structures firmly in position while the molten metal is being applied thereto.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of 166, Fleet-street, patent agent. *For improvements in the manufacture of manure.* (A communication.) Patent dated August 10, 1852.

This invention consists in producing a manure in a state of powder, by the desiccation and pulverization of fish, or the remains of fish, as rich as, if not richer than, and perfectly analogous to, the best Peruvian guano.

The patentee takes fish, or the remains of fish, and disintegrates them, or separates their integral parts either by boiling in common boilers, or by steaming in vessels with double sides. After having been subjected to this preliminary treatment, they are deposited on strainers to drain, and are then submitted to the action of graters, which completes the division of the particles. On leaving the graters, they are placed in bags or between cloths, and pressed, in order to extract as much as possible of the liquid contained in them; a certain portion of moisture will still, however, remain in the pressed matters, and this is removed by crushing the cakes as they come from the presses, and subjecting them to currents of hot air, by which their complete desiccation will be effected. When dry the mass is reduced to powder by any suitable machinery, and is then ready for use as manure.

In order to prevent fermentation from the absorption of moisture, the powder should be beaten whilst being stored away; but if, notwithstanding this precaution, fermentation should still take place, the powder should be sprinkled with acid chloride of manganese, when its progress would be immediately checked.

For some soils a mixture of the bones and skeletons of fish and marine animals, after being ground, with the fish guano, in proportions varying according to the nature of the soil, will in some cases give a manure preferable to pure guano. When these substances are compact and offer too great a resistance to the grinding and crushing process, they should be previously disintegrated by subjecting them to the action of steam, which would not only soften them, but remove the fat and grease so prejudicial to vegetation. When their use is adopted they should, in all cases, be added to the fish, or remains of fish, before the pulverizing process, in order that the action of the mills may effect a complete mixture between the two substances.

The patentee does not claim the application of fish generally to manuring purposes, but he claims the manufacture of manure from fish and the remains of fish, treated in the manner before described, that is to say, disintegrated, desiccated, and reduced to powder.

Edward Joseph Hughes, of Manchester. *For improvements in machinery or apparatus for spinning and weaving cotton-wool and other fibrous substances; and also in machinery or apparatus for stitching either plain or ornamentally.* (A communication.) Patent dated August 10, 1852.

The "improvements in spinning" relate to the mule-machine, and consist principally in a peculiar arrangement of cam for governing the motion of the spindles in building the cops, and in a method of shipping the driving-strap from the fast to the loose pulley.

The "improvements in weaving" relate to looms for producing cut-pile fabrics, wherein the fabrics are woven double with the pile-threads between them, and are afterwards separated by cutting the threads, and consist in an arrangement for holding the warp-threads in position during the operation.

The "improvements in machinery for stitching" comprehend an arrangement of apparatus in which two needles are employed in place of one needle and a shuttle, and a mode of actuating the shuttles of machines in which single needles and shuttles are employed.

Melchior Colson, of Finsbury-square, Middlesex, civil engineer. *For certain improvements in the construction of vehicles.* Patent dated August 12, 1852.

The patentee proposes to construct vehicles for the conveyance of goods on railways, of two or more cylindrical or pentagonal vessels or cases, which may be divided into compartments if required, and are hooped at or near their ends with flanged tyres, similar to those of railway wheels, by which they are guided and kept on the rails, and at the same time much strengthened. A rectangular frame is suspended from the axes of the vessels or cases, and the buffers, draw-links, &c., necessary to enable these vehicles to be formed into trains are attached to the ends of the frames.

Claim.—The direct bearing of the vessels on the rails; that is to say, of the vehicle and its contents.

Specifications Due, but not Enrolled.

Robert Weare, of Plumstead-common, Kent, electrical engineer. *For improvements in galvanic batteries.* Patent dated August 12, 1852.

Francois Bernard Bekaert, of Cecil-street, Strand. *For improvements in the manufacture of zinc white.* (A communication.) Patent dated August 12, 1852.

PROVISIONAL PROTECTIONS.

Dated December 14, 1852.

1052. William Irlam. Improvements in railways.

Dated January 1, 1853.

2. Henry Pentley. Vulcanized India-rubber springs for trousers and breeches, with instructions to adjust the same.

Dated January 6, 1853.

85. Edme Augustin Chameroy. A new composition of different metals or metallic substances.

Dated January 13, 1853.

91. Charles Bullivant and Charles Hackney. An improvement or improvements in certain kinds of spoons and ladles.

Dated January 25, 1853.

183. Amédée François Rémond. A method of ornamenting articles of glass, enamel, and earthenware. A communication.

185. William Thomas Henley. Improvements in covering, laying, and uniting wires and ropes for telegraphic purposes, and in the machinery employed therein.

187. Frederick Simpson. Improvements in combining materials for cleansing or whiteing stone.

189. Alfred Vincent Newton. Improvements in the manufacture of printing surfaces. A communication.

191. Robert William Sievier and Robert William Waithman. Improvements in bleaching animal and vegetable fibrous materials.

193. John Edward Mayall. Improvements in the production of crayon effects by the Daguerreotype and Photographic processes.

Dated January 26, 1853.

195. Isaac Davis. Improvements in optical and mathematical instruments.

197. Nicolas Francisque Ador. Improvements in preparing plastic materials to be used in the manufacture of fired wares, and for other purposes.

199. Charles Nolet. Improvements in indicating time.

201. James Combe. Improvements in machinery for hackling or combing flax and other fibrous substances.

Dated January 27, 1853.

203. Charles Henry Alabaster. Improvements in ploughs.

204. Alfred Barnes Sturdee. A twin-stern ship or vessel with a protected propeller.

205. Edward Brown. Improvements in the blades of table knives.

206. James Murdoch. An improvement in stamping or shaping metals. A communication.

207. Edward Jones Biven. Improvements in the means of communicating signals on railways, and for other purposes.

208. William Galloway and John Galloway. Improvements in steam engines and boilers.

Dated January 28, 1853.

210. Robert Shaw. Starting, stopping, and reversing steam engines.

211. James Learmont. Certain improvements in marine pumps, and apparatus connected therewith.

212. William Tranter. Certain improvements in fire-arms.

213. Alfred Lucas. An improved inkstand.

214. Louis Christian Koeffler. Improvements in bleaching and dyeing.

215. Joseph Scott. Improvements in closing or stoppering bottles, jars, and other receptacles.

216. George Edmond Donisthorpe and John Crofts. Improvements in combing wool, hair, or other fibrous materials.

217. James Pole Kingston. Improvements in combining metals for the bearings and packings of machinery.

219. John Scott Russell. Improvements in constructing ships and vessels propelled by screw or such like propeller.

220. Rowland Speed. Improvements in commu-

nicating between the guard and driver of a railway train, and in the apparatus employed therein.

221. Richard Archibald Brooman. Improvements in cables. A communication.

Dated January 29, 1853.

222 Henry Avins and George Tarplee. A new or improved brick.

223. Harold Potter. Improvements in the mode or method of producing a certain colour or colours on woven or textile fabrics and yarns, and in the machinery or apparatus connected therein.

224. John Standish. Improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials to be spun.

225. William Archer. An improved mode or modes of preventing accidents by improved signals on railways, parts of which improvements are applicable to blast furnaces.

226. Henry Moorhouse. Improvements in the mode or method of preparing cotton, wool, flax, or other fibrous materials, and in the machinery or apparatus employed therein.

227. Francis Mackrory. An invention to prevent all dust, blacks, and spray entering the windows; also a preventive from noise caused by winds, called the pulveris depulsor, or newly-invented window.

229. Francis Whishaw. An improved lock or system of locks.

230. John Ryall Corry and James Barrett Corry. A new and improved method of dressing lambskin leather, and cleaning the wool therefrom.

231. Richard Archibald Brooman. Improvements in diving-bells, and apparatus to be used in connection therewith. A communication.

233. Marcus Spring. Improvement in apparatus for separating gold from matter mixed or combined therewith. A communication.

234. William Watson Hewitson. Improvements in suspending or applying mariners' compasses in vessels built of iron or partly of iron.

235. Henry Batchelor. Improvements in combining metal plates for shipbuilding and other engineering constructions.

236. James Shand. Improvements in ships' fire-engines.

237. Samuel Rogerson. Certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith.

238. Lewis Jennings. An improved construction of lock.

239. William Constable. Improvements in transmitting motive power to machinery, and in regulating the action of rotary machines.

240. William Edward Newton. Improvements in machinery for dressing cloth. A communication.

241. Jean Baptiste Lavanchy. Improvements in the construction of collapsible framework of wood or iron, which may be employed for forming portable bedsteads, houses, parts of houses or bridges, and other similar structures which may occasionally be required to be removed from place to place with facility, economy, and despatch.

Dated January 31, 1853.

241. Thomas Knox. A new or improved rotatory heel for boots and shoes.

245. Charles Caulfield. Propelling vessels through the water, by means of tubular propellers consisting of a tube or tubes containing each a piston moved by steam or any other motive power.

246. Charles Cowper. Certain improvements in preserving butter and other substances. A communication from Jean François Nicolas Brèon.

247. Samuel Perkes. Improvements in the mode of constructing certain works applicable to aqueducts, viaducts, railways, canals, rivers, docks, harbours, lighthouses, breakwaters, reservoirs, tunnels, sea-walls, embankments, submarine foundations, and other useful purposes.

249. Thomas Moreton Jones. An invention for checking or stopping railway trains of carriages, and steadying the carriages when in motion, and preventing jerking and collision of the carriages.

251. Louis Guillaume Perreaux. Improvements in machinery or apparatus for testing and ascertaining the strength of yarn thread, wire strings, or fabrics.

252. Edwin Pugh. Improvements in the means of ballasting ships or vessels, and in rendering them buoyant under certain circumstances.

253. John Mason. Improvements in looms for weaving.

254. Thomas Lightfoot. Improvements in glazes for pottery or other similar materials.

256. David Chalmers. Improvements in looms.

257. Israel P. Magoon. A new and useful improvement in steam-boiler chimneys.

259. William Pizzie. A railway carriage break.

260. Marc Louis Adam Tarin. An improved dustpan.

261. Marc Louis Adam Tarin. Improvements in reflecters for diffusing light.

262. James Comins. A clod-crusher, land-presser, or pulverizer.

263. Samuel Boreham. Certain improvements in timekeepers.

265. John Pinkerton. A new mode of applying and combining ornamented glass in the manufacture of useful and ornamental articles.

266. George Stretton. A certain improvement in soap, hereby denominated "Amylon or starch soap."

267. Charles Hadley. Improvements in the construction and formation of granite and stone pavements and surfaces for carriage and railways.

Dated February 1, 1853.

269. Eliezer Edwards. A new or improved bedstead, which may be used as a vehicle.

270. Thomas Charles Clarkson. Improvements in giving elasticity to certain structures and parts thereof.

271. Edwin Whele. Improvements in candles, and machinery or apparatus for making thereof.

272. Joshua Murgatroyd. Improvements in the construction of boilers and apparatus connected therewith.

273. John Cockerill and Thomas Barnett. Improvements in the construction and use of coffee-roasters.

274. Thomas Williams, James Plimpton, and Robertson Buchanan. A method of actuating ships' pumps by the motion of the vessel at sea, which is also applicable to other purposes.

275. James Carter. An improved rotary engine.

277. William Levesley. Improvements in the construction of pencil-cases.

Dated February 2, 1853.

278. William Gregory. Improvements in the manufacture of bricks and tiles. A communication.

280. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of candles. A communication.

282. Auguste Edouard Loradoux Bellford. A stoppering apparatus for bottles containing liquids of which small quantities are generally poured out at a time. A communication.

284. John Smeeton. Improvements in the manufacture of dials applicable to telegraphic instruments, chronometers, barometers, sextants, quadrants, compasses, clocks, watches, and other timepieces.

286. Owen Williams. Improvements in water-closets.

288. Richard Archibald Brooman. Improvements in expansion valves for steam engines. A communication.

Dated February 3, 1853.

294. George John Newbery. Improvements in hinges. A communication.

296. Benoit Dulaurier. A new application of a system to render boots and shoes waterproof without sewing or nailing whatever, and the said invention to be applied also to render waterproof hats, caps, and general hatting; the invention consists also in the application of machines to the manufacturing of general shoemaking and hatting.

298. James Greenhalgh. Certain improvements in churns.

300. William Richards and Edwin Beck. Certain improvements in machinery for exhausting and driving atmospheric air.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 15th, 1853.*)

76. Christopher James Schofield. Improvements in machinery or apparatus for cutting the pile of fustians and other fabrics.

100. William Potts. Improvements in sepulchral monuments.

105. Richard Archibald Brooman. Improvements in machines for cleaning knives.

110. John Wright and Edwin Sturge. Improved machinery for the manufacture of envelopes.

143. John Lawrence Gardner. Improvements in bottles and other vessels for holding liquids.

159. Benjamin Fothergill. Improvements in certain machinery for preparing to be spun cotton, wool, flax, silk, and other fibrous substances.

178. William Edward Newton. Improvements in stoppers for bottles and other similar vessels. A communication.

189. Alexander Willison. Improvements in thrashing machinery.

216. Archibald Brown. Improvements in the construction of sheaves for blocks.

257. Alexis Delemer. Improvements in machinery or apparatus for manufacturing pile fabrics.

267. Thomas Barker Walker Gale, and Jonathan Fensom. Improvements in the means of joining or coupling bands or straps.

280. William Bissell. An improved cramp or improved cramps for cramping floors, doors, and joiners, and shipwork generally.

298. Edward Joseph Hughes. An improved method of purifying and concentrating the colouring matter of madder, munjeet, and spent madder.

310. William Edward Newton. Improvements in the construction of hydraulic rams.

319. James Johnson. Improvements in heating, ventilating, and sewering cottages or dwelling-houses.

388. Alsop Smith. Improvements in the manufacture of firewood.

443. William Chisholm. Improvements in obtaining caustic soda, and other substances from the residues of articles used in the purification of gas.

536. James Crosby. Improvements in looms.

547. James Henry Smith. Improvements in corsets.

548. William Thorp. Certain improvements in steam boxes and the mode of heating press-plates used in hot pressing of silks, de laines, cobourgs, merinos, fancy goods, and other similar fabrics.

581. Julian Bernard. Improvements in the manufacture of glass.

583. Richard Archibald Brooman. Improvements in revolving fire-arms. A communication.

607. Francis Daniell. Improvements in stamp heads.

610. William Edward Newton. Improvements in the manufacture of capsules or covers for bottles and other hollow articles. A communication.

647. John Henderson Porter. Improvements in the construction of portable buildings and other structures.

714. Henry Huart. Improvements in the storing and preservation of grain.

892. Daniel Woodall. Improvements in canal boats.

958. Alexander Lawrie. Improvements in the manufacture of oars and similar articles.

1064. Jean François Isidore Caplin. Improvements in apparatus for preventing or curing a stooping of the head or of the body.

1167. John Anderson. Heating and ventilating apartments, and for remedying smoky chimneys by a radiant ventilating grate.

1204. Julius Singer. Improvements in wearing apparel.

85. Edme Augustin Chameroy. A new composition of different metals or metallic substances.

122. Frederick George Underhay. Improvements in machinery for mowing or cutting corn and other crops.

137. John Crabtree. Improvements in machinery for winding and doubling yarns.

138. Peter Rothwell Jackson. Improvements in the manufacture of hoops and tyres for railway wheels and other purposes.

146. Augustus Thomas John Bullock. Improvements in taps and cocks.

156. Matthew Andrew. Certain improvements in fastenings for windows.

158. William Joseph Curtis. An invention for excavating or digging earth, and for carrying or delivering the soil.

162. Benjamin Quinton. A new or improved fastening for brooches and other articles of jewellery and dress.

167. John Medworth and Lawrence Lee. Improvements in lithographic presses.

169. Peter Hubert Desvignes and Francis Xavier Kukla. Improvements in galvanic batteries.

179. John Henry Johnson. Improvements in aërial navigation, and in the machinery or apparatus connected therewith. A communication.

187. Frederick Simpson. Improvements in combining materials for cleansing or whiteing stone.

189. Alfred Vincent Newton. Improvements in the manufacture of printing surfaces. A communication.

191. Robert William Sievier and Robert William Walthman. Improvements in bleaching animal and vegetable fibrous materials.

193. John Edward Mayall. Improvements in the production of crayon effects by the Daguerreotype and Photographic processes.

195. Isaac Davis. Improvements in optical and mathematical instruments.

197. Nicolas Francisque Ador. Improvements in preparing plastic materials to be used in the manufacture of fired wares, and for other purposes.

200. John Henry Johnson. Improvements in the method of lubricating machinery, and in the mechanism or apparatus employed therein. A communication.

201. James Combe. Improvements in machinery for hackling or combing flax and other fibrous substances.

203. Charles Henry Alabaster. Improvements in ploughs.

212. William Tranter. Certain improvements in fire-arms.

216. George Edmond Donisthorpe and John Crofts. Improvements in combing wool, hair, or other fibrous materials.

217 James Pole Kingston. Improvements in combining metals for the bearings and packings of machinery.

219. John Scott Russell. Improvements in constructing ships and vessels propelled by screw or such like propeller.

223. Harold Potter. Improvements in the mode or method of producing certain colour or colours on woven or textile fabrics and yarns, and in the machinery or apparatus connected therein.

226. Henry Moorhouse. Improvements in the

mode or method of preparing cotton, wool, flax, or other fibrous materials, and in the machinery or apparatus employed therein.'

231. Richard Archibald Brooman. Improvements in diving-bells and apparatus to be used in connection therewith. A communication.

233. Marcus Spring. Improvements in apparatus for separating gold from matter mixed or combined therewith. A communication.

234. William Watson Hewitson. Improvements in suspending or applying mariners' compasses in vessels built of iron or partly of iron.

240. William Edward Newton. Improvements in machinery for dressing cloth. A communication.

256. David Chalmers. Improvements in looms.

257. Israel P. Magoon. A new and useful improvement in steam boiler chimneys.

272. Joshua Murgatroyd. Improvements in the construction of boilers and apparatus connected therewith.

284. John Smeeton. Improvements in the manufacture of dials applicable to telegraphic instruments, chronometers, barometers, sextants, quadrants, compasses, clocks, watches, and other timepieces.

286. Owen Williams. Improvements in waterclosets.

288. Richard Archibald Brooman. Improvements in expansion valves for steam engines. A communication.

294. George John Newbery. Improvements in hinges. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

328. Auguste Edouard Loradoux Bellford. Improvements in metal musical wind instruments, to be called "Bresson's system." A communication. February 5.

WEEKLY LIST OF NEW PATENTS.

Sealed Feb. 12.

500. Arnold James Cooley.
585. John Whitcomb and Richard Smith.
611. Robert William Sievier.
698. Oswald Dodd Hedley.
944. Page Dewing Woodcock.
1003. Sir John Powlett Orde.
1063. George Elliott and William Russell.
1132. Frank Clarke Hills.
1150. Peter Fairbairn and Samuel Renny Mathers.
1152. Fulcran Peyre and Michael Dolques.

Sealed Feb. 14.

1107. William East.

Sealed Feb. 16.

155. David Stephens Brown.
387. Joseph Major.
430. Richard Archibald Brooman.
525. Myer Myers and Maurice Myers, and William Hill.
839. James Higgin.
970. Asa Lees and Thomas Kay.
1071. Thomas Dunn, Hugh Greaves, and William Watts, junior.
1161. George Bower.
1185. Francis Alton Calvert.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

An Engineer inquires, What is the best and cheapest oil for machinery? Spermaceti, commonly called "sperm oil," is certainly the best; but its great cost precludes its use for many purposes. Next to it, in general advantages, is the French *huile de Colza*, now much used for table-lamps. Its cost is about a third that of sperm oil; and its great freedom from mucilaginous matter greatly recommends it for engineering purposes.

Conversion of Knots and Statute Miles.—We are indebted to some unknown Correspondent for directing our attention to errors in the conversion of statute into geographical and nautical miles, which have found their way into our account of the trial trips of the *Bengal* and the *Agamemnon* in our last Number, and into those also which appeared in the morning papers. Those accounts are forwarded from the actual ports where the trials occur, and it is certainly to be regretted that the computations should not be made with greater precision. Our correspondent is mistaken, however, in supposing that the value of the geographical mile is dependent upon the latitude. If it were so, the nautical mile would be useless as a measure of length as, unless the vessel were sailing upon a parallel of latitude, that measure would change its value from point to point of her course. The

geographical mile is the length of a minute of a great circle of the earth, supposing it to be a sphere of the equatorial radius; that is, a minute of longitude at the equator. Its length is accurately 6075·6 feet, while that of the statute mile is only 5280. These are large numbers to work upon, and would be extremely inconvenient to employ, The ratio of 23 to 20 very nearly expresses that which obtains between the geographical mile and the statute mile; so nearly, indeed, that if we use it to deduce the length of the geographical from that of the statute mile, we shall find the former to be 6072·, which differs only 3 feet 6 inches from the truth. A ratio rather more complicated for practical use could be found to converge still more exactly to the truth; but this will be found sufficiently exact for all practical purposes. In the case of the *Bengal*, the rates, in geographical miles per hour of the trials on the first day—assuming one statute mile to be run in the observed times—are respectively 9·201, 10·125, and 9·339, the mean of which is only 9·555.

J. S. W. S. inquires how a man of limited means should proceed to acquire a patent right for an invention; what is the relative cost of patents and of design-registrations; and whether an article may in the first place be registered, and afterwards patented?—We cannot do better than refer our Correspondent to an epitome of the practice under the new Patent Law, which may be had gratis on application at this office.

J. K., Birmingham, directs our attention to the general want of accuracy in the ordinary tap or stop-cock, and wishes to know by what means a cock, key, or plug can be accurately ground into its seat?—The material commonly employed for this purpose is loam, which cuts brass readily enough, but is sometimes apt to bed itself in the metal. Its grinding action is consequently impaired, and the perfect adaptation of surface to surface soon destroyed. This inconvenience may be avoided by the use of pumice-stone, instead of loam, in the grinding process. All that is necessary is, to crush a lump of pumice-stone into coarse powder, smear the cock-key with good olive oil, upon which sprinkle a little of the broken pumice, and then lightly insert it with a gentle twisting motion. The grinding will go on with great facility. The stone will become reduced into an impalpable mud, heavily charged with the abraided metal, and, in a very short time, the cock will be ground into a true and smooth surface, which it would not be easy to obtain by other means.

T. W. B., Birmingham.—We agree with you in thinking that the merits of Baine's Electric Clock did not receive their fair share of eulogium in Mr. Shepherd's Paper, though we do not suppose there was any intention of depreciating the exertions of a man who has done so much in the cultivation of this branch of experimental philosophy. Under the circumstances, we are disposed to think that the letter of Mr. Baddeley has placed the subject on its right footing; and that it may now be suffered to rest where it is.

"*Inquirer,*" *Derby.*—The most comprehensive, clear, and practical work on the building and management of the locomotive engine within the reach of working men of small means, is Sewell's, which forms No. 78 of Weale's excellent series.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Feb. 11	3422	C. Hodgson and J. Stead	Salford	Self-adjusting tongs for gas-fitters.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

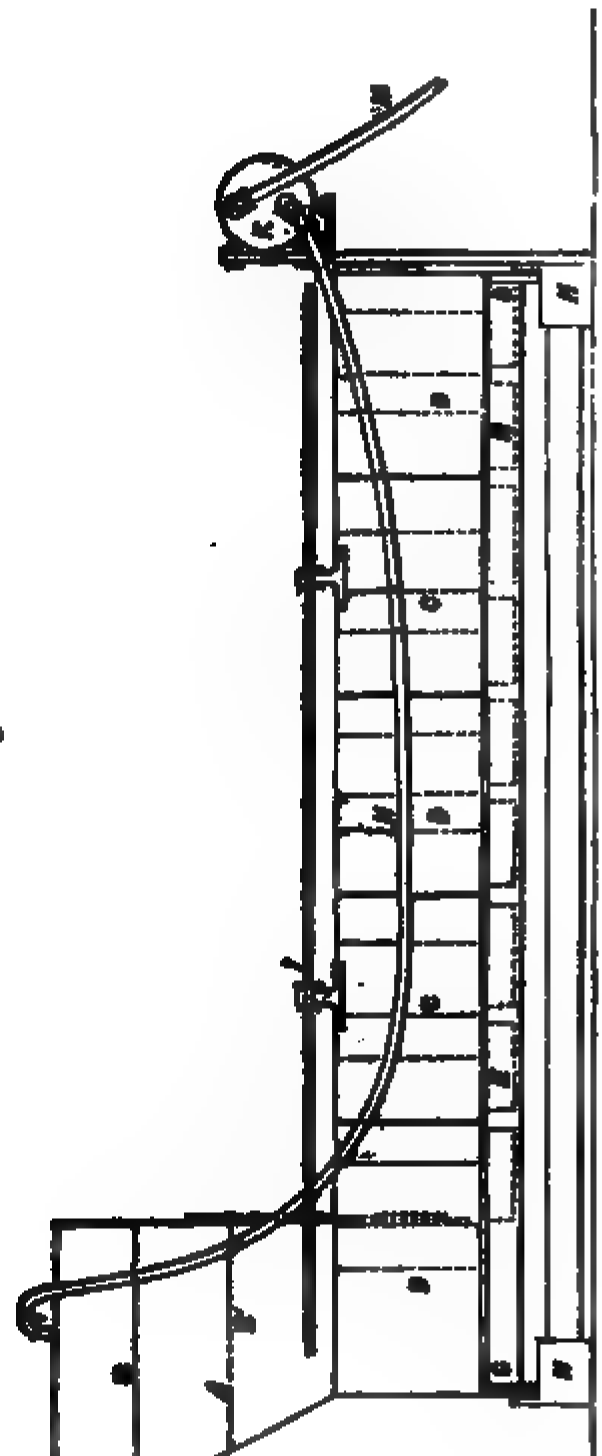
Mechanics' Magazine.

No. 1542.] SATURDAY, FEBRUARY 26, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

SYMOND'S GOLD-WASHING CRADLE.

Fig. 1.



SYMOND'S GOLD-WASHING CRADLE.

(Registered under the Act for the Protection of Articles of Utility.)

The construction and operation of this machine will be readily comprehended from the following description:

Fig. 1 is a side elevation, and fig. 2 a plan of this cradle. A is a hopper for receiving the matter to be operated upon. BB′ two sieves of different-sized meshes, of which B is the coarser. The lower part of the hopper opens into the serpentine channel C, at the point C′, formed by the curvilinear pieces D D, in the manner shown in fig. 2. In the bottom of the channel C are a number of hollow recesses EE, in the spaces formed by the pieces DD for intercepting the heavier particles, which, by their specific gravity, will settle in these recesses or collectors, while the lighter portions of the matter under process of cleaning will pass on through, and from one end to the other of the machine. After these heavier particles have subsided, the residue is allowed to escape through the sluice F.

Fig. 3 is a longitudinal section of one of these recesses, E, and fig. 4 a cross-section. F is the sluice, GG are the rockers, and H the rocking-frame. I I are two handles for working the machine; J is a standard fixed to the rocking-frame H, to support the pump K, which is worked by a rod L attached to the washer. M is the induction, and N the eduction pipe.

THE SABBATH AT SYDENHAM.

Of all the questions of a purely social character in their ultimate principles which now engage attention, there is probably none so momentous—none so fraught with the prospect of vast changes in the moral and intellectual organization of our community—as that great question of absorbing interest, which is rapidly approaching maturity for Legislative consideration, viz., that of the propriety and expediency of allowing the Crystal Palace now erecting at Sydenham to be thrown open to the public on Sundays. A proposition standing out in such bold contrast with the ideas which have prevailed in this country for some centuries upon the rigid observance and discipline of the Sabbath, has naturally enough excited a strong conflict of opinion. It was not to be supposed that the pious convictions of some, and the narrow prejudices of others, should remain unruffled whilst anticipating the first shock of so rude an encounter; nor, on the other hand, that the promulgators of the new principles of Sunday government involved in the prosecution of this undertaking should be unprepared for the storm they were about to awaken—much less that they should retire before its fury. As yet, however, the battle-ground has been but partially occupied. A few skirmishes have taken place between advanced parties of the contending factions—distinguished, indeed, by the zeal, energy, and strategic ingenuity which commonly are the incidents of all disputes having a religious appearance—but the main bodies have so far not been engaged. We have had pamphlets written, meetings held, sermons preached, exhortations delivered of all degrees of style, fervour, and effect, placards posted, inciting to combination and to action, and pithy petitions presented to Parliament; and all this has been done in aid of the operations of either party. Still, however, the great crash of arms is to come. In the meanwhile, both sides are vigorously preparing for the coming strife; the one earnestly looking forward to a compulsory observance of the Sabbath, according to their own views of duty, and the other, with equal zeal, to a Legislative recognition of the Sabbath as a day applicable to intellectual culture as well as to religious exercise.

It is with no intention of attempting

to reconcile or to compromise these antagonistic endeavours, either upon theological considerations, or upon principles of public morality, that we have ventured to advert to the subject. As a general rule, it has been wisely determined by the journalists of science, that politics should be excluded from the sphere of their literary labours. To watch the progress that is being made in the discovery of the laws which govern the physical universe, to estimate with precision the extent and the success of their application to the constantly recurring wants of mankind, and to record all this in such a manner as to reflect the degree of civilization of the day, and to indicate the next direction of human ingenuity, is task enough for them, while its accomplishment is worthy the ambition of the most exalted genius. Occasionally, however, points of public contention arise in the course of human affairs, in which the favourable development of science, art, and intellectual labour is so obviously and so largely involved, that they enlist the deepest interest of every true friend of progress. This is precisely such a question, and one with reference to which it not only becomes us publicly to take an interest, but we should fail seriously in the exercise of our functions were we to refrain from stating our impressions.

The title of this work, the *Mechanics' Magazine*, or the Magazine of the Mechanics, is an ample justification of the interest we freely avow in this momentous question, which we are inclined to think involves much, very much, beyond the mere ceremonial of observance to which one day in seven has, and should always be, devoted. We regard it as altogether supererogatory to say one word in support of an established law which, if it had not the authority of an undisputed Divine origin, recommends itself by its universal adaptation to human necessities and requirements. A periodic rest is essential, not only to animal activity but to animal existence—and the Sabbath of the Christian is so entirely satisfactory in its merely temporal and physical advantages, that we believe, so far as that view of it goes, no man, whatever may be his faith, would raise an objection to it. Every man, at least in our community, will without cavil or question prorogue his labours from Saturday night to Monday morning. Our subject is, however, the mode in which the thinking man, who has wrought through the six days, with head and hand, shall employ the seventh, so as to comply with the Divine command as to its observance, and return to his secular labours on the Monday, better and wiser, happier by religious consolation, and better fitted for the week's task which lies before him, than he could have been but for the admirable law by which God has given recurring periods to human toil.

We shall not in any the smallest degree interfere with the functions of the theologian. We admit freely, and without dispute, what we ourselves believe—the Divine institution of the Sabbath. The only remark we would make is, that since its institution another revelation, and a ten times more glorious one, has been vouchsafed to us, and not the least among its infinite mercies is a modification relaxing some of the sabbatical strictures. Our divinity goes not beyond this. We shall now proceed to show that, according to our view of the subject, a great mistake has been made on the part of those who suppose that the toil-worn man must, as a matter of duty, pass the Sabbath in the puritanic mode of submission to teachings on points of faith, seclusion from ordinary intercourse, prayer, and meditation,—that his senses must on the Sunday receive no impressions from without, but that he must read the Bible (always imperfectly understood by him), humble himself in prayer, &c., &c. No fault can be found with this discipline;—it is wholesome, and will soon recommend itself to the intelligent man. Our only wish is that he should be intelligent, and then we are sure of the result—for ignorance can never be an acceptable sacrifice to the Deity. It has happened since the revival of letters in Europe, and the emancipation of the human mind from priestly domination, that here and there a devout Christian, strong in faith, and far-seeing in philosophy, has ventured to "justify the ways of God to man"—(profane phrase! better to say, to explain to human reason

the ways of God); and we find an abundance of sound divinity, and at the same time as sound philosophy, pervading the works of men eminent for piety, from the age of the revolution, when puritanism may be said to have expired, down to the day of the Bridgewater Treatises—from Dr. Derham, to Dr. Chalmers.

The Almighty has revealed himself to us his creatures in two ways; the one by the Holy Scriptures, the other by the organic and the inorganic books of Nature. From the pulpit we are instructed by the first; the Sydenham Palace will be admirably adapted to display the second. And we are of opinion that a more happy conjunction of means to effect the desired end, than the morning worship and exhortation, followed as it will be by an ample and well-arranged display of the varied wonders of Divine contrivance, and the happy applications to human wants of His admirable laws, through the agency of human thought and reflection, could not be devised for the true advancement of His glory among His creatures. It seems to us a very oblique view of the subject to regard the Sunday opening as a diversion from better and higher things. We deem it, if not exactly according to the word, directly and entirely in the spirit of the command: "Keep holy the seventh day." In what more holy way can the sacred day be employed than by worship, thanksgiving, and contemplation of God as he shows himself in his glorious creation? Let us also recollect, that the artist with his picture, or his statue — the man of science, with his telegraph, his telescope, or his steam-engine — are alike mind and man, engine and instrument, part and parcel of the same creation, and not in any degree the less a wonder, because the rational creature, man,—himself the greatest wonder,—happens to be one element in the circuit. There will be no fear of the old mistake—no chance of putting the creature in the place of the Creator now a days. Science knows no tricks, and religion fears no inquiry. How, then, can the freedom of access to this temple of truth, at any time, or at any season, beget uneasiness?

We have a desire, in passing, to notice what we think a great fact, which we recognise and hail with satisfaction as an evidence of the forward tendency which, in the combination of capital with intellect, characterizes our age. This fact is, that the Sydenham Palace is a commercial speculation. We feel it to be a great privilege that our lot in life has been cast upon a time when the thirst for knowledge is at once so generally diffused, and so judiciously concentrated, as to make such a speculation prudent in a commercial sense; and proud and happy is the country in which is found a population greedy after knowledge, and an union of wealth and intellect ready to supply, on a scale of such magnificence, all the aliment needful for its gratification. The Crystal Palace Company deserves the plaudits of its generation, and most certainly receives them, from the highest to the lowest of the community; even her Most Gracious Majesty on the Throne, and her illustrious Consort, being, we have good reason to believe, favourable to a project so unquestionably beneficial in its tendencies.

To notice the objections that have been raised in various quarters against the opening of the palace on Sundays, is rather beyond the limits we assigned to ourselves at the outset. There is one, however, which we cannot avoid exposing; as great reliance appears to be placed upon it, and it is calculated to distort the true view of the subject. It is said that if this great storehouse of Nature and of Art were opened on the Sabbath, that day would not only lose its sacred character, but working-men would sooner or later lose it altogether as a day of rest, and be compelled to work without the hebdomadal cessation they now happily enjoy. This is rather a strange argument to be put forward by individuals who profess a belief in the divine institution of this sacred day. Its very divinity ought to be the best safeguard they could desire to have for the perfect maintenance of its ceremonials and its immunities. We are not surprised, however, that an extreme anxiety on this point should induce them to watch jealously the slightest encroachment on the rights of labour, so far as they depend upon the Sabbath; and we ourselves should certainly be the first to denounce, and the

last to acquiesce in, any step having even the appearance of such a tendency. But no such alarm has arisen within us. The fact is, that the observance of the Sabbath at the present day, according to the unwritten code which is promulgated so assiduously, and insisted upon so rigidly, is simply impossible. Society is so constituted, that in order that the majorty might rest on Sunday, a very great number must work—and work laboriously, and in the public eye. The impossibility of such an observance ought at least to stagger the advocates of this austerity in the correctness of their conclusions; but as they are inflexibly obdurate in asserting them, we can only deal with them when they are urged. And we say this, that the reverence for the Sabbath is so universal, and so deep-seated in the breast of every one, that there is no chance of its annihilation, if even it possessed no higher guarantees for its permanence. But should all moral obligations ever lose their force, of which the rapidly-improving state of our population does not favour the possibility, we have still the laws to depend upon; and if Ten-hour Bills can so far interfere in the contract between employers and their servants, without objection from any quarter, who will venture to doubt the influence, or in the last resort, the power of the law to keep the Sabbath day apart from the six others?

We do not mean to trespass much longer on the patience of our readers. Enough has been said to justify a fair and unprejudiced settlement of this question; and that point achieved, we shall be satisfied. In the meanwhile we would put it to the common sense of the public, whether those can be the true friends of the human race, who would deprive it of every opportunity of contemplating and reflecting on the glorious works of creation. Of all incentives to religion and devotion, this is undoubtedly the most powerful and the most noble. The great Humboldt has finely said, that "mere communion with Nature—mere contact with the free air—exercises a soothing, yet strengthening, influence on the wearied spirit, calms the storm of passion, and softens the heart when shaken by sorrow to its inmost depths." Who doubts this? And what rational man would seek to deprive his fellow-men of so holy an influence? When David exclaimed, in rapture, at the majesty of creation, "The heavens declare the glory of God, and the firmament showeth his handy work!" did he not prize the happiness of being able to contemplate His great work, in the calmness of intelligent thought? The vastness of the universe is the great school in which we must graduate to acquire an idea of the immeasurable grandeur of Omnipotence; while the more we look into the component parts of creation, and dive with all our powers of investigation into its minute and multifarious details, the more do we perceive the workings of that Infinite Wisdom which has filled the world with life, harmony, and beauty. Along with this perception is always awakened within us an unbounded reliance in the superintending care of Providence, and a happy submission to its dispensations. What a glorious lesson! How happy should they be who have opportunities of acquiring it! How unfortunate those who find themselves debarred from it! How deluded those who would shut it out from our eyes and from our hearts!

That these ideas have been entertained by those in whom goodness and wisdom have been happily united, is evident from the writings of many of the most celebrated philosophers, moralists, and poets of all countries and times; as to which we need only call to mind the admirable summary of the entire subject, which, with his characteristic elevation of thought, and beauty of composition, has been presented to us in the words of our immortal bard:

> "sermons in stones,
> Books in the running brooks,
> And good in everything."

But it is idle to pursue any further a subject which no powers of language, and no efforts of philosophy or of reason can resolve to the satisfaction of all minds. It is enough that we should discharge the duty which we think devolves upon us of declaring our earnest attachment to the popular side of this great question, and of stating a few common-sense points which should recommend it to the support of every

rational and disinterested individual. At the same time we feel convinced that it admits of a clear and decisive vindication upon the most rigid view of revealed doctrines. Were it not so, indeed, any other mode of establishing it must in a large measure fail in force and dignity. Receiving, however, according to our own view, in which many clergymen distinguished for their piety and their enlightenment participate, full effect from religious, historical, and political considerations, anxiously supported, as we believe, by an overwhelming preponderance of numbers and of intelligence, and, above all, promising to yield the best results for the spread of knowledge, morality, and even religion, we fearlessly entrust the issue to the justice of Parliament, and the unquestionably progressive spirit of our age.

STAMP DUTIES (LETTERS PATENT) AND INDEXES OF SPECIFICATIONS ACT.

The following is a copy of the Act "To substitute Stamp Duties for Fees on passing Letters Patent for Inventions, and to provide for the purchase for the public use of certain Indexes of Specifications:"

Whereas it is expedient that the fees payable in respect of Letters Patent for Inventions under the Patent Law Amendment Act, 1852, and mentioned in the schedule to such Act, be converted into Stamp Duties: Be it enacted, therefore, by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. Sections seventeen, forty-four, forty-five, forty-six, and fifty-three of the said Patent Law Amendment Act, 1852, and so much of the schedule to the said Act as relates to fees and stamp duties to be paid under the said Act, shall be repealed.

II. All Letters Patent for Inventions to be granted under the provisions of the said Patent Law Amendment Act, 1852 (except in the cases provided for in the fourth section of this Act), shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively from the date thereof, unless there be paid before the expiration of the said three years and seven years respectively the stamp duties in the schedule to this Act annexed expressed to be payable before the expiration of the third year and of the seventh year respectively, and such Letters Patent, or a duplicate thereof, shall be stamped with proper stamps showing the payment of such respective stamp duties, and shall, when stamped, be produced before the expiration of such three years and seven years respectively at the office of the Commissioners; and a certificate of the production of such Letters Patent or duplicate so stamped, specifying the date of such production, shall be endorsed by the clerk of the Commissioners on the Letters Patent or duplicate, and a like certificate shall be endorsed upon the warrant for such Letters Patent filed in the said office.

III. There shall be paid unto and for the use of Her Majesty, her heirs and successors, for or in respect of Letters Patent applied for or issued under the provisions of the said Patent Law Amendment Act, 1852, warrants, specifications, disclaimers, certificates, and entries, and other matters and things mentioned in the schedule to this Act, or the vellum, parchment, or paper on which the same respectively are written, the stamp duties mentioned in the said schedule; and no other stamp duties shall be levied in respect of such Letters Patent, warrants, specifications, disclaimers, certificates, entries, matters, and things; and the stamp duty mentioned in the said schedule on office copies of documents shall be in lieu of such sums as by the said Patent Law Amendment Act, 1852, are authorized to be appointed to be paid for such office copies.

IV. Where Letters Patent for England, or Scotland, or Ireland, have been granted before the commencement of the said Patent Law Amendment Act, 1852, or have been since the commencement of the said Act, or hereafter may be granted for any invention, in respect of any application made before the commencement of the said Act, Letters Patent for England, or Scotland, or Ireland may be granted for such invention in like manner as if the said Act had not been passed: provided always, that in lieu of all fees or payments and stamp duties which were at the time of the passing of the said Act payable in respect of such letters patent as last aforesaid, or in or about obtaining a grant thereof, and in lieu of all other stamp duties whatsoever, there shall be paid in respect of such Letters Patent as last aforesaid on the sealing thereof stamp duties equal to one-third part of the stamp duties which would be payable under this Act in respect of Letters

Patent issued for the United Kingdom under the said Patent Law Amendment Act, 1852, on or previously to the sealing of such Letters Patent as last aforesaid, and before the expiration of the third year and the seventh year respectively of the term granted by such Letters Patent for England, Scotland, or Ireland, stamp duties equal to one-third part of the stamp duties payable under this Act before the expiration of the third year and the seventh year respectively of the term granted by Letters Patent issued for the United Kingdom under the said Patent Law Amendment Act, 1852, and the condition of such Letters Patent for England, or Scotland, or Ireland shall be varied accordingly.

V. The stamp duties hereby granted shall be under the care and management of the Commissioners of Inland Revenue; and the several rules, regulations, provisions, penalties, clauses, and matters contained in any Act now or hereafter to be in force with reference to stamp duties shall be applicable thereto.

VI. The said Commissioners of Inland Revenue shall prepare stamps impressed upon adhesive paper, of the amounts following, that is to say, twopence, fourpence, eightpence, and one shilling, to be used only in respect of the stamp duties on the office copies of documents and on the certificates of searches and inspections mentioned in the schedule to this Act; such adhesive stamps of proper amounts to be affixed by the clerk of the Commissioners of Patents for Inventions to such office copies of documents and certificates of searches and inspections as aforesaid; and immediately after such affixing he shall obliterate or deface such stamps by impressing thereon a seal to be provided for that purpose, but so as not to prevent the amount of the stamp from being ascertained; and no such office copy or certificate shall be delivered out until the stamps thereon shall be obliterated or defaced as aforesaid.

VII. The condition contained in any Letters Patent granted under the said Patent Law Amendment Act, 1852, and before the passing of this Act for making such Letters Patent void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the sums of money and stamp duties by the said Patent Law Amendment Act, 1852, required in this behalf, shall be deemed to be satisfied and complied with by payment of the like stamp duties as would have been required if such Letters Patent had been granted after the passing of this Act, and had been made subject to the condition required by this Act in lieu of the said condition therein contained; and the provision hereinbefore contained concerning the endorsement on the Letters Patent or duplicate, and on the warrant for the same Letters Patent, of a certificate of the production of the Letters Patent or duplicate properly stamped, shall be applicable in the case of such Letters Patent granted before the passing of this Act.

VIII. And whereas by the said Patent Law Amendment Act, 1852, the Commissioners are directed to cause indexes to all specifications heretofore or hereafter to be enrolled or deposited to be prepared in such form as they may think fit, which indexes are to be open to the inspection of the public: And whereas the existing specifications so directed to be indexed as aforesaid are in number fifteen thousand and upwards, and it would require some years to make indexes thereof on a proper arrangement and classification: And whereas Mr. Bennett Woodcroft has already made complete indexes of such specifications, which the Commissioners have examined and approved of, and it is expedient that such indexes be purchased for the use of the public:

It shall be lawful for the Commissioners, with the consent of the Commissioners of her Majesty's Treasury, to purchase the said indexes of the said Bennett Woodcroft for a sum not exceeding one thousand pounds, and to pay the purchase money for the same out of the moneys in their hands which have arisen from fees received in respect of Letters Patent under the said Patent Law Amendment Act, 1852, and directed by the said Act to be paid into the receipt of the Exchequer; and after the purchase of such indexes the provisions of the said Act shall be applicable thereto as if such indexes had been prepared under the said recited enactment.

IX. The word "Duplicate" shall be construed to mean in this Act such Letters Patent as may be issued under the Twenty-second Section of the Patent Law Amendment Act, 1852, in case of any Letters Patent being destroyed or lost.

X. This Act and the Patent Law Amendment Act, 1852, shall be construed together as one Act.

Schedule of Stamp Duties.	£	s.	d.
On Petition for Grant of Letters Patent	5	0	0
On Certificate of Record of Notice to proceed	5	0	0
On Warrannt of Law-Officer for Letters Patent	5	0	0
On the sealing of Letters Patent	5	0	0

	£	s.	d.
On Specification..............	5	0	0
On the Letters Patent, or a Duplicate thereof, before the Expiration of the Third Year....	50	0	0
On the Letters Patent, or a Duplicate thereof, before the Expiration of the Seventh Year..	100	0	0
On Certificate of Record of Notice of Objections	2	0	0
On Certificate of every Search and Inspection	0	1	0
On Certificate of Entry of Assignment or Licence........	0	5	0
On Certificate of Assignment or Licence	0	5	0
On Application for Disclaimer .	5	0	0
On Caveat against Disclaimer ..	2	0	0
On Office Copies of Documents, for every Ninety Words	0	0	2

THE TRADES OF BIRMINGHAM.

Another advance of 9*l.* per ton in the prices of copper was announced on Thursday; thus the advance, within about six months, has been cent. per cent., and there is little doubt but that it will go much higher. As much as 140*l.* has been paid for a ton, and 150*l.* is freely talked of as the next advance. Manufacturers look forward with apprehension to the consequences which of necessity must follow the continuance of high prices. As yet, however, although they are slightly felt in some branches, brassfounders and coppersmiths are generally busy.

The Battery Company,—one of the largest establishments in the kingdom,—are in possession of immense orders; and other manufacturers represent that, considering the advance of metals, there is an extraordinary demand for Birmingham goods. Brass and copper wire are at the present time articles of Birmingham manufacture in great request. The establishments of Mr. Samuel Walker and Mr. Paul Moore are fully employed in this branch of our staple trade. In the former works an extensive order for an electric telegraph company (submarine it is presumed) is in course of execution, and shows the perfection to which this manufacture is now brought. A piece of No. 16 copper wire is here seen, in one piece, three miles long, having been drawn from a bar five-eighths in diameter. Before subjected to the process of drawing and scaling, it weighed 128 lbs., but lost 14 lb. in the process. This, by those acquainted with wire-drawing, is looked upon as a most remarkable production, and many have refused to believe in its existence until they had personal proof of the fact.

In connection with this branch, we may mention that the new forge just registered by Mr. Onion, of Bradford-street, for welding telegraph wire, and by which the material may be put together and completed with great expedition, has been supplied to several large wire-workers, and found to answer the purpose exceedingly well. The same manufacturer has also registered some portable forges for out-door work, which have met with the approval, amongst other firms, of that of Fox, Henderson, and Co., of Smethwick.

The demand for the Australian market increases, notwithstanding the enormous quantity of goods already sent out to that fortunate colony. Any money for revolvers, but they are not to be had. The merchants here are daily watching the manufacturers, with cash in hand, to buy up all, as fast as they are turned out of the proof-house; and buyers from London, and other shipping ports, impatient of the delay in the transmission of their orders, are arriving daily to purchase wherever they can. In the percussion cap trade, which is extensively carried on in Birmingham, considerable activity prevails; though larger orders were expected at this season of the year. Tin has advanced in price this week 5*l.* per ton extra, and it has now become almost impossible to lay hold of a block of it, even at the enormous quotations of from 113*l.* to 135*l.* per cwt. The London holders are certainly realizing a most profitable harvest; and how long they will be able to pursue the present ruinous system, no one can tell.

The general hardware trade of the town is good; although it will be seen, from the returns of the Board of Trade just issued, that there was last year a considerable falling off in the exports of these articles of domestic manufacture, as compared with the previous year, to a considerable amount. The month's transactions are not given in these returns; but we much fear that, when published, they will, in consequence of high prices, exhibit a still further decline. Nor ought it to be forgotten, that in certain articles of hardware, the Germans, in point of cheapness, if not of quality, have for some years been fast superseding the English makers. German tools, at the present time, constitute an important portion of a factor's stock. In the heavier descriptions of implements, our continental rivals have made little progress. An unfortunate difference has sprung up between some of the brass-founders of this town and their employers. The precise nature of the dispute has not yet been clearly stated; but the men have appealed to the sympathy of the workmen of the town, and called upon them for assistance in their struggle. These un-

fortunate affairs are deeply to be regretted at any time, but particularly at present, when abundant orders are on the books, and masters and men ought to be reaping the benefit of the fortunate change which has taken place in the state of trade. A few months ago, hands were to be had at any price, however low; now, good hands can hardly be had at any price, however high.

THE IRON TRADE.

Birmingham.—The iron trade of this district is described as being "easier" than it was a week or a fortnight ago; but still the leading firms demand nothing less than the price fixed on quarter-day. In consequence of the reduction in Scotch pigs, which are now coming freely into the market, Staffordshire and Shropshire pigs are a shade lower, and there is a probability of there being some further reduction. Holders very naturally become fearful of a reaction. The market price for hot blast pigs is *5l.* 10s., and the Shropshire iron-masters are getting *6l.* for those delivered at Stourport. Plates, bars, and rails generally maintain their prices; but we have heard, in some instances, of their being offered at lower rates. There appears to be no abatement of orders. Most, if not all, of the furnaces and iron-works in South Staffordshire which remain standing are being repaired, for the purpose of being put into operation; and any available portion of mine which remained ungotten in bad times is now either changing hands for the purpose of being worked, or is being gotten by the proprietors themselves.

Glasgow Pig Iron-market—Glasgow, Feb. 19.—Our pig iron-market has been quiet, but firm, all the week. To-day some anxiety to buy was manifested, and holders becoming shy sellers, prices advanced to 54s. 6d. to 55s. cash for warrants, at which some business was done.

America.—By the United States' mail steam ship *Baltic*, which arrived at Liverpool on Saturday, with advices from New York to the 7th inst., it appears that the iron-market of that city was firm, but quiet; some holders were asking thirty-seven dollars (six months) for Scotch pig, but no sales were reported at that price.

THE "HIGH BRIDGE," AT PORTAGE, NEW YORK.

(From the *Canadian Journal.*)

The Buffalo and New York and City Railroad is one of the branch roads which have sprung from the New York and Erie-road, and is the more especially interesting to us, as bringing the six-foot gauge to our frontier, and which will at an early date be continued to the mouth of the Niagara River, when it will form one of the many routes of travel which will connect advantageously with the lines of road now being built in Canada. At Portage, the fruitful valley of the Genesee, famed at other points for its gentle slopes and teeming farms, is contracted to a deep and narrow gorge, through which the river dashes over three successive falls of about 350 feet, between almost perpendicular banks of rock, piled in horizontal strata, of from 10 to 30 feet in thickness, to a height immediately below the Middle Fall of about 800 feet. Thirty yards above the Upper Fall, at a point where the banks are 800 feet asunder, the railroad crosses at a height of 234 feet above the bed of the river. Viewed from the foot of the fall, which adds 100 feet to the height of the structure, a passing train, relieved against a clear sky, has a wonderful and beautiful appearance; while the view from the train, embracing as it does a large portion of Wyoming, is one of surpassing grandeur.

The bridge over the valley was designed by Mr. Silas Seymour, the chief engineer to the Company; and the successful economy with which he has succeeded in overcoming the difficulties opposed to him, is entitled to great praise, especially when we take into account the short space of time in which the works were completed. The piers on which the trestles rest are of the best Ashlar masonry, of compact sandstone obtained from the banks of the river; their base is 75 feet by 15 feet; they are carried up with a slight batter to a height of 30 feet above the bed of the river, and coped with heavy limestone blocks. Upon these are placed the timber trestles, connected with each other in a very secure manner, by a system of braces and girders.

The trestles are 190 feet in height from the top of the piers. At their base they are composed of 21 vertical posts, 14 inches by 14 inches, diminished in number to 15 feet at the top; and in size to 12 inches by 12 inches. The lateral and longitudinal braces, and also the girders, are 6 inches by 12 inches. Each trestle or pier is calculated to be capable of sustaining a weight of 1,000 tons, in addition to its own. The trusses resting on the top, and connecting the several trestles or piers, which are 50 feet from centre to centre, are 14 feet in depth, and are composed of three framed girders, with main counter and sway braces, in the usual manner. On the top of these trusses the track is laid. The whole length of the bridge is 800 feet, and each span, with the exception of that across the canal,

which is 54 feet, is 50 feet. The arrangement of the structure is such that, when any particular piece becomes defective, it can be taken out and replaced without disturbing other parts of the bridge. The occurrence of fire is, therefore, the chief danger to which it is liable, and against such a calamity every precaution is taken. Tanks of water are placed at convenient distances, and watchmen are employed day and night.

The total cost of the bridge is about 35,000*l.* currency, and the quantity of material employed in its construction is as follows:

Masonry	9,200 cubic yards.
Timber	183,500 cubic feet.
Wrought iron ..	49 tons.

It was estimated that the cost of a stone viaduct would have been about 250,000*l.*, the interest of which, at 7 per cent., would renew the present structure every two years. It was also estimated that the interest on the cost of a wrought-iron tubular bridge, of 500 feet span, with stone piers and suitable approaches, would renew the present bridge every third year. The masonry was commenced on the 1st of July, 1851, and the first locomotive passed over it on the 14th of August, 1852, embracing a period of only thirteen and a half months; a rapidity of construction which speaks volumes for the energy and zeal of the contractors, Messrs. Lauman, Rockafellow, and Moor, who were also the contractors for the whole line of the road, and have been long connected with public works.

The manner in which the piers or trestles were erected may be worthy of notice. They were commenced on the eastern bank, and as each trestle was completed, the trusses were placed on them, and the track laid; upon which a travelling-crane was advanced, overreaching the space to the next trestle, and by means of which each stick of timber was let down to its place, until the whole of the next pier was completed, when the truss was placed and the crane advanced as before. This is, we believe, the highest timber bridge in the world; and though not notable for the development of any new principle of construction, it is worthy of notice for the cheapness, the quickness, and the completeness with which it has obviated a serious obstacle in the way of an important line of railroad,—all matters of first-rate importance to us at this moment.

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the Chair. The evening was entirely devoted to the renewed discussion of Mr. B. Cheverton's Paper, "On the use of Heated Air as a motive power."

The construction of Ericsson's engine, and the application of the regenerator were first described; and it was then argued that the action of the regenerator almost amounted theoretically, to the creation of force, and that it was not of the utility that had been presumed. From the best accounts, it appeared that various practical difficulties existed in the application of heated air as a motive power; and, from calculations which were entered into, it was shown, that the mean pressure of the air in the working cylinder being 4¼ lbs., the engines making eleven strokes per minute, a total power was developed which, after making a proper deduction for friction and waste, did not exceed 208 horse-power with the cumbrous machinery which was described. It was then contended that with such a fine model of a ship, and under the circumstances of the experiments, a greater speed than seven miles an hour ought to have been attained, with a less expenditure of fuel, and that therefore, at present, the caloric engine could not be practically regarded as a successful innovation.

Tables and diagrams were exhibited, for the purpose of showing the relative amount of power obtainable from a given quantity of heat, applied in expanding air and in producing steam, showing that, after taking into account all the conditions of each case, the useful effect would be nearly the same, independent of the regenerator, which, if not a fallacy, would turn the scale in favour of the use of heated air.

It was submitted by other speakers, that the machine involved a mechanical fallacy, as the regenerator produced no mechanical effect whatever. It might be granted, that the regenerator of Ericsson's engine received and re-delivered the heat in the manner described, and that when the working piston was descending, the heat was deposited, and that when ascending, the heat was restored; but that operation could only result as a *consequence* of the motion of the piston, and not as a *cause* of its motion; hence no mechanical effort was made. This result was easily shown, by assuming the contents of the pump to be 1, and the contents of the working cylinder to be 2. If the working piston was at the bottom of the cylinder, and in equilibrio with the external atmosphere, as regarded the pressure on a unit of surface, and then began to move and the air to be heated, in its passage through the regenerator, from 32° to a temperature of 512°, so as to double its volume, the lower piston would constantly

produce a vacuity, so to speak, of 2, to be constantly fed by a supply of 1, from the pump, expanded into 2, by the increase of temperature—consequently the piston, at every instant of its motion, remained in equilibrio with the external atmosphere, and no mechanical effect could result. Still, in Ericsson's engine a mechanical effect had been produced; but then this mechanical effect was no greater than would be produced without the aid of the regenerator; by the simple action of the furnace itself, and not so economically as by the use of steam.

Further investigations were entered into of the theory of the air-engine, and the general result appeared to exhibit so much distrust of the accounts already received, of the working of the caloric ship, that it was suggested that the further discussion of the subject should be adjourned for a few weeks, and meanwhile another paper was proposed to be written, so that the question could be more fully discussed on the next occasion.

The following Paper was announced to be read at the meeting of Tuesday, March 1st, "On the Increased Strength of Cast-Iron, produced by the use of Improved Coke," by Mr. William Fairbairn, M. Inst. C.E.

ADDITION OF AIR-VESSELS TO SUCTION-PIPES.

Sir,—I have read with considerable satisfaction, in a recent American Scientific Journal, some details of experiments upon the application of air-vessels to the suction-pipes of pumps, made by Messrs. Kirchweger and Prusman, engineers, of Hanover. I have been practically familiar with the advantages of this application for the last seventeen years, but as I am not in any way connected with engineering pursuits—as the use I made of it fully effected the object for which it was intended—as I saw nothing in it at the time but its complete efficiency in that individual case—and as such cases do not often present themselves, I scarcely thought it then of sufficient importance for publication. On many subsequent occasions I have thought differently, but perhaps should not now have troubled you upon the subject, but for the confirmation of my own views by these Hanoverian experiments, so far as they go. I will now detail the circumstances under which I resorted to this expedient, as at once an elucidation of the principle upon which it depends, and a practical and triumphant illustration of its efficiency.

In the year 1836, I occupied a house in a seaport town, nearly the whole of which was built upon an ancient beach of sea sand, under which was a deposit of carboniferous peat overlying a stratum of tough clay, which reposed in its turn upon another sea-beach of coarse sand and gravel. Immediately under this, at a depth of from 28 to 35 feet, the primitive rock (Sienite) was invariably found over the entire area of surface upon which this town stands. A good supply of water was always obtainable from the lower stratum—coarse sand and gravel—by sinking a well down to the rock, and so ready a resource was taken full advantage of; so that but few houses were unprovided with a well and a pump.

The house which I occupied stood in nearly the centre of this geological basin. It was built simultaneously with several others upon a piece of ground which was a garden fourteen years before the circumstances I am about to describe. Attached to this garden was a mansion of some pretensions, to which belonged an excellent well, which was thought quite equal to the supply not only of this house, but also of as many of the new ones as could get access to it. Now, as the house and the garden were the property of the same owners, when the building allotments upon the garden were made, the right to a free use of the well was sold with some three or four of them, mine amongst the rest. This well was connected with a pump in my yard by a 1¼ inch pipe, 130 feet horizontal length, which was laid along in the sand and under some of the adjoining houses, so that in its course it passed under four party-walls, each of four stories. We shall now see what was the consequence of this very faulty arrangement. You will observe that amongst the enumerated strata upon which this town stands is one of a very compressible kind—peat—which, although ten or twelve feet below the surface, yielded slowly indeed, but certainly, to the partial pressure of the walls. Subsidence to a certain extent took place, generally without any distortion beyond a few cracked ceilings, and my pipe kept its right of way for more than thirteen years, when symptoms of stricture became at length observable. In the course of a few months it became entirely impervious. A collapse had taken place, and remedy was impossible.

To sink a well in loose sand, in a yard 20 feet by 12, bounded on three sides by walls four stories in height, would have been to bring them all about my ears. Nothing remained but to try what boring might do. The Artesian system had more frequently failed than otherwise in this place, and that, too, under much more promising circumstances. The professed well-borer to whom I applied gave me no hopes of success, and I

set about it with many misgivings. However, a 4-inch sheet-iron pipe was soon passed down to within 6 inches of the rock (29 feet 6 in.), in which the water rose 7 feet 6 in. A pump was set to work, and a scanty supply of water was obtained, but so loaded with sand and gravel, that it was impossible to keep the pump going more than about half an hour at a time. It had then to be cleared, re-leathered, &c. The flow of water did not seem to increase, nor the proportion of sand to diminish.

It now struck me that the laborious and jerking action of the pump was the main cause of all this annoyance. The inelastic medium, water, was not present in sufficient quantity at once to replace the ascending piston, and consequently the rapid recurrence of the workman's downward stroke caused a percussive, or successive action at the bottom of the mixed column of sand and water, which entirely prevented their separation; and hence all the difficulty. The water might be sufficient if the sand were not present. The remedy was obvious. The water rose in a state of rest 7 feet 6 in. in the pipe, or within 22 feet of the surface. Nothing more was necessary, therefore, than to sink a shaft some little depth below this 22—say 23 feet, and the water would flow tranquilly until it had reached its normal height, from whence the pump would raise it. Such is the condition of many Artesian wells. This, however, would have been to sink a well; the very thing I wished to avoid. If I could get the water to flow continuously to, or above the surface, of course all difficulty would cease. This I at once saw was practicable, the whole length of column being far under the limit of atmospheric pressure. The borer's pump, with its pipe, was at once renewed, the external or 4-in. iron pipe cleared of the sand, and a 3-in. lead pipe inserted in it. The old yard pump was connected 4 feet below the surface with this lead pipe, the top of which was furnished with a flange level with the stone pavement of the yard, into and upon which flange a carboy, or globular glass vessel, of the capacity of ten gallons, was inverted, its neck projecting into the lead pipe. Being then secured and luted to the flange, the pump was set to work; and after a few strokes the water rose in a gentle boil into the bottle, bright as crystal, not another grain of sand was seen, but as the pump made its succession of strokes, the water rose and fell in the bottle, which remained about half full, under the most rapid action which could be given to the pump. Of course the bottle was not left, but a similar air-vessel was put in connection, just under the pavement; and there I have no doubt it still remains.

This experiment not only convinced me of the utility of an air-vessel upon a suction pipe, in the especial case described, but also of its advantages in all cases. The action of this pump, for its perfect ease, softness, and equability, I have never seen equalled.

I have been told, I know not how truly, that the Artesian well near Trafalgar-square does not afford the supply expected from it —that, in fact, the ornamental water (so to call it) in the square, is pumped up over and over again. Let them try my bottle experiment, and they will get a continuous supply from their iron pipes, three or four times greater than they do at present; and as good water is of some value in London, no difficulty will be found in applying it usefully, to say nothing of the hocus-pocus of the present unmeaning display.

I am, Sir, yours, &c.,

C. R.

The Farmer's Manual of Agricultural Chemistry. By A Normandy. George Knight and Sons.

We have much pleasure in calling the attention of our agricultural readers to this very clever compendium. The title, a "Manual," or "Hand-book," is exactly descriptive of its pretensions, and after a careful and gratifying perusal of its contents, we have no hesitation in saying that these pretensions are fully and ably sustained. The subject, the Chemistry of Agriculture, would seem at the first glance to place the book somewhat out of our path; but conscious as we are that the *Mechanics' Magazine*, in common with other scientific periodicals of the day, has found its way to the notice of a class which, up to our own time, was in a great measure the patient of prescriptive tradition, but which is now rapidly taking its place amongst the great intelligences of the age, we do not think it in any degree irrelevant to direct the attention of such of our readers as may be interested in agriculture, to the appearance of a book which seems to us exactly adapted to their wants and wishes.

At the close of the last century, Chemistry had apparently but little to do with the ordinary arts of life. Slight glimmerings were indeed perceptible here and there, in the processes of the metallurgist, the potter, the glass-blower, the dyer, the calico-printer, and a few others, but the association of Chemistry with the rude operations of the plough and the harrow was not even dreamt of. In the present day, the importance of chemical knowledge to

the farmer is deemed indispensable. The labours of a host of men of the highest scientific celebrity, from Chaptal and Davy to Liebig and Johnston, the repeated trials to which their theories have been subjected, and the prospective advantages held out to encourage a continued advance in a knowledge of the sciences upon which vegetable life depends, have so clearly shown the dependence of the art of agriculture upon the science of chemistry, that nothing remains but to aid the farmer in so needful an acquirement.

We are of opinion that this manual is eminently fitted for the purpose. Much of what has been written on this subject is found in connection with other applications of the science, forming now and then a chapter or so in a general treatise; and, again, other valuable information may be found in the shape of separate papers on particular soils, manures, and crops; but we think the farmer will be thankful to the man who has devoted his very intimate knowledge of the subject to a careful and elaborate enunciation of all that has been written upon it, in a well-organized yet condensed treatise, in which reference can be easily made to any one of the sections into which he has judiciously thrown it. His qualifications for the task he has imposed upon himself need not be stated now. In his "Commercial Hand-book of Chemical Analysis," his "Practical Introduction to Rose's Chemistry," his well-known edition of "Rose's Chemical Analysis," and in other of his works, he has displayed a profound acquaintance with the general subject of chemical analysis; and at the same time he has given the most satisfactory proof of being in possession of means of communicating to others his own knowledge, and the experience he has acquired in a long course of experimental research.

The analysis of soils he has rendered a matter of easy manipulation. Their combination, and artificial adaptation to specific objects of culture, he has also treated with much clearness, and as little technicality as the matter admits of. In addition to these essential points of instruction, he has added entomological information, of infinite value as regards the preservation of crops from insect depredation—one of the most important branches of agricultural economy. We have only to add, that the book is profusely illustrated with superior wood-engravings, which very much enhance its value for practical purposes.

THE ISTHMUS OF DARIEN SHIP CANAL.

On Thursday evening last, Dr. Edward Cullen explained to a large auditory, at Wyld's "Globe," Leicester-square, the geographical, engineering, and other details of the great project now at length being carried into effect, for effecting a continuous water communication between the Carribbean Sea and the Pacific Ocean, by cutting a ship canal, of about 25 miles in length, across the Isthmus of Darien, which would unite Port Escocés on the Atlantic side, with the Gulf of San Miguel on the Pacific side. The beautiful concave model of the configuration of our planet was admirably adapted for this purpose, showing the generally easy character of the country, and the comparatively small amount of labour which nature has left to man to perform. He commenced by pointing out the great advantages that would accrue to the commercial world, by connecting the Atlantic and Pacific by any canal whatever, rather than by letting ships, as at present, pass from one ocean to the other, by going round Cape Horn or the Cape of Good Hope. The great distance and the uncertain winds that attended passages round either of the Capes to India, China, or Australia, and the fine weather, the smooth seas, the fair and gentle trade winds, and the pleasant temperature that attended such passages across the Pacific, highly favoured the undertaking. The various ship canals across the Isthmus that had hitherto been proposed were, the Tehuantepec or Mexico; the Nicaragua, from San Juan del Norte to Realejo, and from San Juan del Norte to San Juan del Sur; the Atrato, by Napipi and Cupica; the Chagres, or Limon Bay, to Panama; and the Darien, from Port Escocés to the Gulf of San Miguel. Very serious objections, of a geographical, climactical, or engineering character, applied to all these routes except the Darien. The Tehuantepec had neither harbour nor coast; the Nicaragua had bad harbours, requiring locks, and being unnavigable by large ships; and the Atrato and Chagres labour under similar disadvantages. The Darien was stated to be the only practicable route. It was but 39 miles in length, from Port Escocés, or Caledonia Bay, to the Gulf of San Miguel, by way of the river Savana, and in a direct line but 33. A plain extended from the sea-shore nearly 2 miles to the base of some hills, only from 300 to 400 feet high. This ridge was divided by transverse valleys that did not exceed 150 feet in elevation, and the base was only 2 miles in width, with a plain extending for 13 miles to a point on the river Savana, 20 miles above its mouth. It was thus seen that the country was almost a plain, with the exception of an elevation of 150 feet to the extent of 2 miles. The greatest distance of cutting was 30 feet, and

the canal would be without locks—an advantage which was not offered by any other route. Port Escoscés was a very safe and extensive harbour; the largest vessels of war could enter it, and lie close in shore—the water along a great extent of the bay being, within a yard or two of land, 6 fathoms deep. The Gulf of San Miguel, which opened into the Pacific, had also good depth of water, would hold the shipping of the world, and had a mouth 10 miles across. The ship canal communication would be to cut from Principe, which was in lat. 8 deg. 34 min., and lon. 77 deg. 56 min., to Port Escoscés, a distance of about 25 miles, of which there would be 3 or 4 of deep cutting. The canal, to be serviceable, must be cut 30 feet deep; and that would be deep enough to allow the tide of the Pacific to flow right through it across to the Atlantic, so that ships bound from the Pacific to the Atlantic would pass with the flood, and those from the Atlantic to the Pacific with the ebb-tide of the latter. The Canal would be 160 feet wide, and the alternate currents from the Atlantic to the Pacific, which occurred every six hours, would cause the canal to last to the end of the world, as it would be gradually enlarging it, widening the banks and deepening the bottom. Towage would be dispensed with; and from the tide flowing at the rate of three or four miles an hour, it was very possible that the passage could be effected in 6 or 6½ hours. A question having been put to the lecturer by a gentleman in the audience, as to whether there was not a difference in the height of the two oceans, Dr. Cullen replied that it was a doubtful point; Col. Lloyd had certainly stated that there was a difference of 6½ feet, and Humboldt 2 or 3 feet, but the fact had not yet been satisfactorily ascertained. There was, however, a great difference in the rise of tide; in the Pacific it was from 21 to 27 feet; in the Atlantic only 2 feet. A description of the inhabitants of Darien, the healthful nature of the climate, and other points of minor interest were included in the explanation, which was listened to with great attention by a numerous and highly respectable audience.

[This subject has been minutely detailed in a highly interesting and valuable work on the subject by Dr. Cullen, which collects the results of all the explorations and surveys that have been made in this remote region. Its advantages over rival schemes, seem to be placed beyond dispute. The banks of the Savana, which traverses a large portion of it, being elevated above the level of the water, it is free from swamp and malarious miasmata, by which Chagres, Port Limon, Panama, and Portobello suffer. An entomological proof of the freedom of the entire country from Port Escoscés to the Gulf of San Miguel from swamp is found in the fact that mosquitos are absent from it, and they infest all swampy grounds within the tropics. For anchorage and harbours, too, there is a fine line of coast at either end of the channel, and the geographical superiority of the route is best seen by the following list of the respective lengths of the several proposed lines:

	Miles.
The Tehuantepec (Mexico) route	198
The Nicaragua route, from San Juan del Norte to Realejo	273
The Nicaragua route, from San Juan del Norte to San Juan del Sur......................	170
Atrato route, by Napipi and Cupica	172
Chagres or Limon Bay to Panama	51
Darien route, from Port Escoscés to the Gulf of San Miguel....	39

In the consideration of this project, however, there is one point that strikes us, and must certainly strike others, which, though it in no way touches its feasability, nevertheless deserves attention. From physical circumstances, we are disposed to doubt the possibility of dispensing with lockage or inclined planes. It is well known that the rotation of the earth produces a great accumulation of water in the West Indian Sea, the level of which is certainly higher than that of the Pacific on the other side of the land. Authorities differ in their estimation of the difference of level, but as the Gulf stream is originated by the operation of the same cause, and the influence of that great current is perceptible on the Coast of Ireland, the pressure of water must be very considerable on the Eastern Coast of this Isthmus, as compared with the other side. If this be so, and a free water communication be opened between the two oceans, it seems to us that the result must be a permanent flow of water with great velocity from the Atlantic to the Pacific, which nothing but lockage can surmount.]

IMPORTANT CHANGES IN PORTSMOUTH DOCKYARD.

Mr. Lambert, Assistant Chief Engineer of Portsmouth Dockyard, has left Her Majesty's service, having been offered, and accepted, an appointment as Superintending Engineer to the General Screw Steam Navigation Company at Southampton, at a much more advantageous and remunerative salary than that given him at this dockyard. Mr. Lambert is a very able engineer; he has been in this dockyard only a few years, and obtained his scientific knowledge in the

extensive establishment of Messrs. Maudslay, Sons, and Field.

The Central Mathematical School in this dockyard is to be abolished, the head-master (Dr. Woolley) being transferred to another sphere, and the pupils turned over to the department of Professor Rawson, whose assistant, we believe, is to be removed. We perceive also by the Navy Estimates, that only six months' salary is rated to the lecturer on chemistry and steam (Mr. Hay), from which it is augured that the appointment held by him is also about to be abolished.

The Ordnance Survey.—About 1,300 persons are at present employed in the Ordnance Survey. They have now completed maps of several large towns in England, on a scale of 60 inches to the mile; of Ireland, Lancashire, Wigtonshire, and portions of Kirkcudbrightshire, Lewis, Yorkshire, and Dumfries-shire, on a scale of 6 inches to the mile; and of the south of England, on a scale of 1 inch to the mile. Maps on a scale of 6 inches to the mile, of several other Scotch counties, are preparing, as well as 1-inch maps of Ireland and Scotland.—*Advertiser.*

Clifton Suspension-Bridge.—All hopes of proceeding with this undertaking appear to have been abandoned. It has been stated that the wrought iron, which has been so long ready for the proposed structure, has been sold to the West Cornwall Railway Company; and, instead of forming part of the "permanent way" across the water from Clifton to Leigh, it will perform that office on the line of the above railway.—*Bristol Journal.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING FEBRUARY 24, 1853.

DANIEL ADAMSON AND LEONARD COOPER, of Newton Wood Iron-Works, near Hyde, Cheshire. *For certain improvements in the construction of steam engines and steam boilers, also in the method of using and rarefying steam, part of which improvements are applicable to marine, locomotive, and other boilers, and marine architecture in general, as well as in cisterns, tanks, and articles of a like nature.* Patent dated August 12, 1852.

The *first* improvement specified under this patent consists in constructing steam boilers with horizontal flues and vertical or diagonal tubes through which the products of combustion from the furnaces are caused to pass before escaping into the chimney. The principal advantage gained by this arrangement is, that there is no danger of the tubes becoming choked by dust, ashes, &c., which, owing to their peculiar position do not pass into them as is the case when the tubes are horizontal.

The *second* improvement consists of a mode of uniting metal plates for constructing circular fire-boxes, for ship building and for the formation of vessels for containing fluids, by turning up flanges on the abutting ends of the metal plates to be united, then bringing these flanges to meet each other, and bolting or riveting, or welding them together with or without a hoop or ring of metal interposed, which ring may be of copper to allow for any slight inequalities in the thickness of the plates.

The *third* improvement consists of a mode of arranging the expansion valves of steam engines when such valves are placed in the slide-valve chest at the back of the slide valve, on which they operate, so as to reduce or increase at pleasure the quantity of steam admitted to the cylinders according to the load on the engine.

The *fourth* improvement consists in constructing the air-pumps of steam engines, whether worked in a horizontal or vertical position with solid plungers, and with the delivery-valve at the bottom of the pump, by which arrangement the ordinary valve in the plunger is enabled to be dispensed with.

The *fifth* improvement consists of a method of packing the pistons of steam engines in which the packing is expanded by means of screws passed through the piston plate, which, when turned, act on a ring with wedge-formed projections, by which the packing ring is pressed outwards.

The *sixth* improvement consists in rarefying steam on its passage from the steam generator to the engine cylinder, by causing it to pass through tubes around which hot air circulates continuously.

The *last* improvement consists in rarefying steam by any convenient contrivance on its passage from the high to the low-pressure cylinder of compound engines.

RICHARD LAMING, of Millwall, Middlesex, chemist. *For improvements in the manufacture and burning of gas, in the treatment of residual products of such manufacture, and of the distillation of coal, or similar substances, and of the coking of coal.* Patent dated August 12, 1852.

The *first* improvement consists in constructing brick ovens used for the simultaneous production of gas, and heavy coke for locomotives and foundry purposes, enclosed by an exterior case of sheet-iron,

whether such case encloses one oven only or more than one.

The *second* improvement consists in employing platinum tubes, or tubes lined with that metal, for conveying steam to the interior of furnaces to be decomposed for the production of gas for illuminating or other purposes.

The *third* improvement consists in treating the residual product of the purification of coal gas by oxide of iron in such manner as to obtain a material suitable for being again used as a purifying agent, with the production of fumes of sulphur to be applied to manufacturing uses. The patentee subjects this product which contains sulphur, iron, calcium and vegetable or carbonaceous matter, to a low heat, so as to drive off the sulphur in the state of fumes of sulphurous acid, leaving the remaining material in a fit state for use, either with or without additional roasting. The fumes of sulphurous acid may be used to act on ammoniacal liquors, or on solutions containing ammonia, or carbonate, or hydrosulphate of that base, or on corresponding compounds of the oxides of sodium or potassium, whereby sulphite and hyposulphite of the bases operated on will be produced.

The *fourth* improvement consists in obtaining sulphur and oxide of iron from the spent oxide of iron used in the purification of coal gas. The patentee takes this material and reduces it with water in a pugmill, he then passes the liquid holding the sulphur and oxide of iron in suspension, through sieves which intercept any solid matters, and finally separates the substances by subsidence; or the sulphur might be separated by applying superheated steam to act on the compound containing it.

The *fifth* improvement consists in applying oxide of iron in combination with oxygen gas for purifying coal gas, by which means the conversion of the oxide of iron into a sulphuret is prevented. The oxygen gas for this use is obtained by heating the artificial peroxide of manganese; which possesses this advantage over the natural peroxide, that after having been deprived by heat of its oxygen it will reabsorb a fresh portion from the atmosphere on being exposed to its influence in a moderately-heated state, by which means the same material may be continuously used for an indefinite length of time.

The *sixth* improvement consists in arranging gas purifying-vessels in such manner that the purifying materials shall be spread on shelves arranged one above the other in the same vessel, and the gas introduced from below; and after the material in the first compartment has been exhausted a communication shall be opened to the second compartment, and so on throughout the series, by which means the necessity for frequently opening the doors of the purifier is obviated.

The *seventh* improvement consists of a method of supplying air to Argand burners from above only, by causing it to pass downwards between concentric tubes of glass and to be supplied to the burner in a more or less highly heated state, according as the space for its admission below the inner concentric tube is diminished or increased by adjusting the tubes with respect to each other.

The *eighth* improvement consists in obtaining sulphate of ammonia from the ammoniacal liquors of gas-works by a combination of the following processes:—The ammonia is first separated in its simple form, or as carbonate of ammonia by any known means, after which it is converted to sulphite of ammonia by causing streams of sulphurous acid to be brought in contact with it, and the sulphite of ammonia is finally converted to sulphate by exposing it to the combined influences of atmospheric air and water.

The *last* improvement consists in producing alum and sulphate of alumina from the coke of boghead or cannel coal. This material is first reduced to a white ash by burning it in heaps in the open air, but at a low temperature, so as not to cause the fusing of the alumina and silica contained in it, and is afterwards lixiviated with hot sulphuric acid until all the alumina has been removed. The coke may in some cases be crushed and submitted at once to the action of the sulphuric acid, instead of being previously reduced to a friable ash.

NATHANIEL JONES AMIES, of Manchester, manufacturer. *For certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith.* Patent dated August 12, 1852.

The patentee describes and claims,

1. A peculiar combination of cams and other apparatus for giving tension at irregular intervals to the threads in braiding-machines, for the purpose of producing a more regular and uniform braid.

2. The manufacture of fabrics having the threads alternately doubled and braided, by which a new species of braid is produced.

3. The employment in braiding-machines of "roses" and "drivers" of various sizes, in connection with each, by which arrangement a great variety of patterns may be produced on the braid.

WILLIAM PALMER, of Sutton-street, Clerkenwell, manufacturer. *For improvements in the manufacture of candles and candle*

lamps, and in packing candles and night-lights. Patent dated August 19, 1852.

The "improvements in the manufacture of candles" have relation to the preparation of the wicks, and consist in applying to their sides, in a stripe or line, a mixture containing some alkaline salt, which shall tend to promote combustion and cause the wick to burn out of the flame, or control or correct its tendency to do so. For this purpose the patentee prefers the use of borax, and he makes a paste suitable for preparing wicks by boiling in water 4½ ozs. of borax, 4½ ozs. of bismuth, 4 ozs. of flour, and 8 ozs. of charcoal powdered. The only other alkaline salt indicated is bicarbonate of soda, which would be used in a similar manner.

The "improvements in candle lamps" consist in making the nozel to slide in stems or guides, and in placing the coiled spring exterior to such stems or guides.

The object of the "improvements in packing candles and night-lights" is to enable the productions of the patentee to be distinguished from others in the market, and this is effected by packing the candles and night-lights in paper which has been creased or embossed on its surface in par rallel lines.

Claims.—1. The mode of applying alkaline salts to candlewicks to promote combustion.

2. The mode of combining the parts of candle lamps.

3. The mode of packing candles and night-lights.

Henry Rawson, of Leicester. *For improvements in preparing and straightening wool and other fibrous materials.* Patent dated August 19, 1852.

Mr. Rawson's improved machinery consists mainly of a revolving drum having bars of metal attached to it and carrying rows of comb teeth, the length and fineness of which will depend on the quality of the fibres operated on. Between the rows of teeth are clearers which are pressed constantly outwards by means of springs, but only pass outwards to their full extent at one point of the revolution of the drum, that is when they come opposite the stripping rollers. The wool, or other fibre, is fed on to the drum by rollers direct from a feed-apron, or by a screw gill, and is laid well on to the teeth of the drum by means of a brush revolving in contact with it. The revolution of the drum causes the fibres to be drawn out and straightened, and the action of the clearers delivers the prepared material to the stripping-rollers, when the clearers by the revolution of the drum have come immediately opposite to them.

Claim.—The mode of combining mechanical parts into a machine for preparing and straightening wool and other fibres.

PROVISIONAL PROTECTIONS.

Dated January 17, 1853.

116. Adolphe Iglesia. Improvements applicable to machinery or appparatus for reeling or winding silk, cotton, or other fibrous substances, for the purpose of measuring or gauging the same. A communication.

Dated January 21, 1853.

154. William Edward Newton. Improvements applicable to clocks and other timekeepers, for the purpose of indicating not only the time of the day, but the day of the week, the month, and the year, which invention he intends to denominate "Hawe's Calendar Clock or Timepiece." A communication.

Dated January 26, 1853.

196. Antoine Galy Casalat. A new barometer and steam gauge.

Dated February 1, 1853.

276. Alfred Vincent Newton. Improvements in block-printing machinery. A communication.

Dated February 2, 1853.

279. Auguste Edouard Loradoux Bellford. A new and useful composition of matter, termed "metallic oil," to be used for lubricating the axles of wheels and the rubbing or working parts of steam engines, and every description of machinery and apparatus, for softening hemp and other fibrous substances preparatory to spinning the same, and for other purposes. A communication.

281. Auguste Edouard Loradoux Bellford. Improvements in life-boats and vessels of a similar nature. A communication.

283. Auguste Edouard Loradoux Bellford. Improvements in furnaces and apparatus combined therewith, for making wrought iron directly from the ore, and for collecting and condensing the oxides or other substances evaporated in the process of deoxydising iron or other ores. A communication.

285. John Verinder Kiddle. Improvements in cocks or taps.

287. Ismael Isaac Abadie and Henri Lauret. An improved manufacture of parasols.

289. Thomas Paine. Improvements in heels for boots, shoes, and other coverings for the feet.

Dated February 3, 1853.

291. Manoah Bower. A new or improved apparatus to prevent the throwing up of mud by the wheels of vehicles.

293. William Scarlett Wright. An improved bath.

295. John Bower. Improvements in and applicable to certain descriptions of engines for driving piles.

297. John Henry Johnson. Improvements in gas-burners, and in regulating the combustion of gas. A communication.

299. Alfred Tylor and Henry George Frasi. Improvements in water-closets.

301. John Crowther. Improvements in baking bread.

Dated February 4, 1853.

302. William Brown. An improvement or improvements in the construction of metallic bedsteads.

303. David Lloyd Price. Improvements in sig

nalling by electricity on railway trains and railways, and in the appliances used therein.

304. Frederick John Jones. Improvements in fastenings for bands, belts, straps, and other similar articles. A communication.

305. Philip Webley. Improvements in repeating pistols and other fire-arms.

306. George Winiwarter. Certain improvements in the application of explosive compounds.

307. John Perkins. Improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom.

308. Roberts Griffiths. Improvements in the manufacture of bolts and rivets.

309. John Dudgeon. Improvements in machinery used for raising propellers.

310. Jacob Vale Asbury. Improvements in railway carriages.

311. William Edgar. An improved boot, particularly suitable for the use of emigrants and persons at sea.

312. George Letts. Improvements in machines for cutting and mincing meat and other materials for sausages and other like purposes, and for filling the prepared skins with the meat and other materials when so cut.

313. William Walker. Certain improvements in apparatus to be employed for the purposes of drying.

314. Alfred Woodward. A double-action vertical lever churn.

315. Alfred Woodward. A self-acting cam-press.

Dated February 5, 1853.

316. Richard Prosser. Improvements in the construction of printing rollers used in machines for printing calicoes and other substances.

317. Thomas Peacock. Certain improvements in weaving, and in machinery for weaving hat-plush and other cut piled fabrics.

318. George Hewitson. Improvements in machinery or apparatus for measuring or indicating the length of yarn as it is spun or wound on bobbins or rollers.

319. Antoine Wollowicz. Improvements in primers for fire-arms.

320. John Whitehouse the elder and John Whitehouse the younger. Certain improvements in the manufacture of knobs for doors and other like uses, part of which improvements is applicable to the manufacture of certain articles of earthenware.

321. Charles Frederic Werckshagen. Certain improvements in the manufacture of carbonate of soda and potash.

323. William Crossby. The consumption or burning of smoke.

324. John Campbell. Improvements in the treatment or finishing of textile fabrics and materials.

325. Henry John Nicoll. Improvements in garments for travelling.

326. Alexander Parkes. Improvements in the separation of certain metals from their ores or other compounds.

327. Edward Palmer. Improvements in carriages used on railways.

329. Joseph Cowan. Improvements in propelling steam vessels.

Dated February 7, 1853.

330. William Romaine. Improvements in rendering wood more durable and uninflammable.

331. William Scott, Robert Brough, James Rinoe, and Thomas Mann. Improvements in steam engines.

332. John Londe Tabberner. Improvements in the mode of smelting iron and other ores, and in the manufacture of lime.

333. John Londe Tabberner. Improvements in the application of granite and similar substances to ornamenting purposes, and to the construction of buildings.

334. Richard Archibald Brooman. Improvements in sail hanks for securing stay-sail jibs and other sails to their proper stays. A communication.

Dated February 8, 1853.

335. Auguste Edouard Loradoux Bellford. Improvements in the treatment of bituminous and asphaltic matters, rendering them applicable to various useful purposes. A communication.

336. Thomas Howarth. A certain improved cement for closing steam or other joints.

337. John Buchanan. An improved propeller, as to affixing the blades in the boss, and affixing the bosses to the spindle or centre shaft, and in the mode of placing it, and in controlling, lowering, and detaching the same.

338. Thomas Allan. Improvements in protecting telegraph wires.

339. Thomas Allan. Improvements in galvanic batteries.

Dated February 9, 1853.

340. Thomas Reynolds, Henry Reynolds, and Stephen Reynolds. Improvements in the means of retarding the progress of carriages.

341. Henry Pooley. Improvements in weighing machines. Partly a communication.

342. William Edward Newton. Improvements in machinery or apparatus for digging, excavating, or removing earth. A communication.

343. William Binks, Samuel Bennett, and Thomas Storey. Certain improvements in pumps or apparatus for raising and forcing fluids.

344. John Little. Improvements in lubricating mechanism.

345. William Birkett. Improvements in treating soapsuds or wash-waters in which soap has been used.

346. John Seaward. Improvements in marine engines.

347. Isaiah James Machin. An improvement in nut-crackers.

348. Charles Iles. Improvements in pointing wire.

349. John Webster. Improvements in treating animal matters, and in manufacturing manure.

Dated February 10, 1853.

350. James Spotswood Wilson. Improvements in the construction of furnaces or flues, whereby economy in the use of fuel, the consumption of smoke or gases, and the utilising thereof are ensured.

352. Charles Cuylits. Improvements in apparatus for regulating or governing the speed of steam or other engines. A communication.

354. John Hunter. Improvements in the manufacture of textile fabrics.

356. James Anderson. Improvements in steam engines.

358. Henry McFarlane. Improvements in machinery for excavating. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February* 18*th*, 1853.)

18. Thomas Dickason Rotch. Improvements in treating peat, and in manufacturing fuel and other products therefrom.

63. John Fordham Stanford. Improved machinery and apparatus for manufacturing bricks, tiles, and similar building materials, which is hereby denominated "the complete brickmaker."

107. Henry Columbus Hurry. An improved construction of fountain pen, or reservoir pen-holder.

142. Henry Bernoulli Barlow. Improvements

in the manufacture of cylinders for carding cotton and other fibrous substances.

226. Diego Jimenez. Improvements in the manufacture of soap.

254. Robert Shaw. An invention for pre-arranging, ascertaining, and registering the rate of travelling of locomotive engines, and of railway or other carriages.

(*From the "London Gazette," February 22nd, 1853.*)

7. John Henry Gardner. Improvements in toilet-tables.

66. George Holmes. Certain improvements in the manufacture or construction of coats, capes, and other upper garments of personal attire.

72. Edward Wilkins. Improvements in the distribution and application of water or other liquid manure to promote vegetation.

91. William Walker. Improvements in wheels for railway carriages, and in the mode or modes of manufacturing the same.

111. John Remington and Zephaniah Deacon Berry. Improvements in gas meters or apparatus for measuring gas or other elastic fluids.

147. Edwin Whele. Improvements in apparatus for burning candles, and in horological apparatus attached thereto.

156. Joseph Brown. Improvements in beds, sofas, chairs, and other articles of furniture, to render them more suitable for travelling and other purposes.

175. Michael Cavanagh. Certain improvements in mortice lock spindles.

222. Aristide Balthasard Bérard. Improvements in the construction of jetties, breakwaters, and docks, and other hydraulic constructions.

227. Benjamin Mitchell. Improvements in the construction of artificial legs.

242. William Mackenzie and George Blair. Improvements in the arrangement and construction of graduated scales for measuring instruments.

283. Thomas Graves. Improvements in the method or means of obtaining and employing motive power.

292. Samuel Rainbird. Improvements in grappling and raising sunken vessels and other submerged bodies, and in apparatus for that purpose.

311. Auguste Edouard Loradoux Bellford. Improvements in apparatus for manufacturing soda-water and other aërated liquids.

371. Walter McFarlane. Improvements in water-closets.

383. Donald Grant. Improvements in the means of applying the heat derived from the combustion of gas.

431. Henry Hughes and George Firmin. Improvements in the manufacture of lamp-black, and in recovering from such manufacture a substance suitable for fuel.

436. Robert Mole and Robert Mole, junior. Invention of improvements in the manufacture of swords and matchets.

495. David Crichton. Arrangements and apparatus for producing continuous circular motion, giving a series of different velocities obtained from alternate motions applicable to looms and other machines.

504. George Kennedy Geyelin. An improved machine for grinding pigments or other vegetable or mineral substances.

526. James Nasmyth. An improved mode of utilizing running waters.

545. Charles Benjamin Normand. Improvements in machinery for sawing wood.

546. James Nasmyth. Improvements in the mode of obtaining and applying motive power.

562. Arnold James Cooley. Improvements in treating woven and felted fabrics, to render the same repellent to water and damp.

577. John Crowther and William Teall. Improvements in obtaining motive power.

598. Henry Brock Billows. Improvements in the construction of gas-burners for illuminating and heating purposes.

811. Benjamin Walker and William Bestwick. Improvements in the manufacture of braid, and the machinery or apparatus employed therein.

1082. Archibald Slate. An improvement in propulsion.

1083. Archibald Slate. Improvements in the production of motive power from elastic fluids.

1084. Archibald Slate. Improvements in propelling vessels.

1090. Archibald Slate. Improvements in the arrangements for working the slide valve for the induction and eduction of fluids.

1091. Archibald Slate. An invention in steam boilers.

1157. Joseph Burch. Certain improvements in passenger and other carriages.

1209. Thomas Benjamin Smith. Improvements in calcining certain ores, and in the construction of furnaces for that purpose, and for converting certain products arising in the process into an article of commerce not heretofore produced therefrom.

51. Hezekiah Marshall. Certain improvements in the transmission and emission of air and sound.

142. Richard Mountford Deeley. Improvements in the grates of furnaces used in the manufacture of glass.

152. George Thornton. Certain improvements in propelling vessels.

154. William Edward Newton. Improvements applicable to clocks and other timekeepers, for the purpose of indicating not only the time of the day, but the day of the week, the month, and the year, which invention he intends to denominate "Hawes's Calendar Clock or Time-piece." A communication.

220. Rowland Speed. Improvements in communicating between the guard and driver of a railway train, and in the apparatus employed therein.

224. John Standish. Improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials, to be spun.

242. George Twigg and Arthur Lucas Silvester. Improvements in apparatus for cutting and affixing stamps and labels. Partly a communication.

250. Walter Williams, junior. Improvements in machinery for cutting or shearing iron and other metals.

254. Thomas Lightfoot. Improvements in glazes for pottery or other similar materials.

273. John Cockerill and Thomas Barnett. Improvements in the construction and use of coffee-roasters.

275. James Carter. An improved rotary engine.

276. Alfred Vincent Newton. Improvements in block printing machinery. A communication.

278. William Gregory. Improvements in the manufacture of bricks and tiles. A communication.

285. John Verinder Kiddle. Improvements in cocks or taps.

295. John Bower. Improvements in and applicable to certain descriptions of engines for driving piles.

299. Alfred Tylor and Henry George Frasi. Improvements in water-closets.

304. Frederick John Jones. Improvements in fastenings for bands, belts, straps, and other similar articles. A communication.

307. John Perkins. Improvements in the treatment of certain bituminous mineral substances, and in obtaining products therefrom.

309. John Dudgeon. Improvements in machinery used for raising propellers.

310. Jacob Vale Asbury. Improvements in railway carriages.

312. George Letts. Improvements in machines for cutting and mincing meat and other materials for sausages and other like purposes, and for filling

the prepared skins with the meat and other materials when so cut.

326. Alexander Parkes. Improvements in the separation of certain metals from their ores or other compounds.

345. William Birkett. Improvements in treating soapsuds or wash-waters in which soap has been used.

347. Isaiah James Machin. An improvement in nut-crackers.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

389. Valentine Cocker and Reuben Herbert. Certain improvements in and applicable to looms for weaving. A communication. February 15.

WEEKLY LIST OF PATENTS.

Sealed Feb. 19, 1853.

10. Freeman Roe.
109. William Austin and William Sutherland.
296. Alfred Trueman.
317. William Scholfield and Joseph Pritchard.
877. Thomas Ainsley Cook.
898. William Edward Schottlander.
918. Joseph Skertchley, junior.
959. James Murdoch.
1001. Anthony Norris Groves and Conrad William Finzel, junior.
1058. Rudolph Appel.
1068. Anthony Norris Groves.
1094. Alfred Krupp.
1096. James Langridge.
1123. Warren De La Rue.
1128. Ephraim Moseley.
1149. Jean Louis David.
1168. George Ingham.
1171. George Gwynne and George Fergusson Wilson.
1183. Claude Joseph Edmée Junot.
1184. Samuel Clegg.
1203. Robert Stephen Oliver.
14. Charles Edwards Amos.

Sealed Feb. 22, 1853.

203. Robert Hazard.
576. Bowman Fleming M'Cullum.
851. William Wilkinson.
1093. William Wilkinson.

Sealed Feb. 23, 1853.

199. Edwin Bates.
253. Charles De Bergue.
258. David Chalmers.
330. Henry Moorhouse.
560. Arthur Ashpital and John Whichcord, junior.
625. John Cameron.
1188. John Whichcord, junior, and Samuel Egan Rosser.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Feb. 18	3423	J. Barlow	King William-street	Spring Hat Suspender.
19	3424	J. Baker	Birmingham	Pencil-case.
,,	3425	G. Marr	Russell-square	Gas Stove.
25	3426	M. Roth, M.D.	Old Cavendish-street	Russian Bath.

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The Farmer's Manual of Agricultural Chemistry ... 172
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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1543.] SATURDAY, MARCH 5, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

ELLIOTT'S ROTARY ENGINE AND PUMP.

Fig. 1.

Fig. 2.

Fig. 3.

ELLIOTT'S ROTARY ENGINE AND PUMP.

The accompanying figures represent a highly ingenious engine, on the rotary principle, applicable also to pumping, which has been invented by Mr. Thomas Elliott, of Stockton-on-Tees.

Fig. 1 is a cross section of the engine; fig. 2, a longitudinal section on the line A 1 in fig. 3, and fig. 3 an end elevation, showing the method of coupling the shafts of the pistons without spur gearing.

R R, fig. 2, is the cylinder, or casing of the engine; D D, fig. 1, the working cylinder. A and B are the induction and eduction ports, which may be used indifferently, according to the direction in which the engine is to be worked. C C are the pistons, which are of an elliptical form, and are mounted on the shafts J J, so that their similar axes shall be at right angles, and that they shall revolve in contact with each other, but in opposite directions. E E is the packing for the pistons, F the valve-spindle, and G the valve. H H is the packing at each end of the pistons. I is the exhaust-pipe, and O O the steam pipe and valve casing. Q stuffing-boxes for the shafts J J and the end packings of the pistons.

The operation of the machine is as follows:—On steam being admitted at A, fig. 1, it causes the revolution of the two pistons, in the direction shown by the arrows *a a*, the pistons moving constantly in contact with each other at all points of their revolution. When the motion of the engine is required to be reversed, steam is admitted through the opposite port and the pistons are consequently caused to revolve in the opposite direction, what was formerly the steam port being now made the exhaust.

The method in which the pistons are kept in place, and by which they are coupled together so as to give off their motion in the same direction, is shown in fig. 3, where J J are the piston-shafts, on which are keyed two cranks, K K, of equal size. The crank-pins work in brasses M M, attached to the ends of the connecting-rods P P, and the opposite ends of the connecting-rods carry similar brasses, which embrace the pins of the two arms of the bell-crank lever L L. This lever works on the fixed pin or shed N. Motion may then be taken from the opposite end of either of the shafts J by any convenient means.

LONDON FIRES IN 1852.—PART I.

TWENTY-SECOND ANNUAL REPORT. BY MR. WILLIAM BADDELEY, C.E.,

Inventor of the Portable Canvas Cisterns, Improved Jet Spreaders, Farmers' Fire Engine, Every Man his own Fireman, &c., &c.

"The statistics of London fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fireproof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

Eighteen hundred and fifty-two has passed away, with all its responsibilities and cares. A motley crew they are, these years—some joyous, as when a period of famine is succeeded by a plenteous harvest, or a long war is terminated by a general peace, or a noble invention or happy discovery offers rich promise of new treasures to mankind; some gloomy season of disease, of strife, of man warring against the elements; some merely dull and monotonous, neither cheered nor damped by any unusual events, and destined to burden the memory of no future chronologer.

Of man's warring with the element of fire in our metropolis of London, the following particulars are a brief record:—The total number of fires reported is 923; being 5 less than in the preceding year. Of these fires, 250 were extinguished by the inmates, without external aid; 377 were extinguished by the inmates, with casual assistance; while the

extinction of 296 devolved upon the firemen. Parish engineers either wholly extinguished or materially assisted in the extinguishing of 59 fires. The total number of calls given at the fire-engine stations was 1,105,—a decrease of 54 upon last year's number. In 25 instances the premises were totally destroyed; in 238, considerably damaged; while in 660 cases the damage was very trifling.

The following Table shows the monthly distribution, which in 1852 was unusually irregular:

Months.	Number of Fires.	Fatal Fires.	Number of lives lost.	Chimneys on fire.	False Alarms.
January	89	4	4	14	9
February	82	0	0	11	14
March	100	2	2	11	7
April	79	1	1	12	12
May	93	1	1	6	8
June	58	2	2	8	7
July	93	5	6	7	10
August	72	3	3	8	4
September	65	3	5	2	7
October	57	2	3	8	7
November	69	1	1	5	5
December	66	3	3	7	8
Total	923	27	31	89	93

Instances in which insurances were known to have been effected upon the building and contents	442
Upon the building only	124
Upon the contents only	74
No insurance	283
	923
Alarms from chimneys on fire	89
False alarms	93
Making the total number of calls	1,105

The number of fatal fires again exhibits an increase on those of the previous year, as does also the number of lives lost. The fatal fires may be classed as follows:

	Fires.		Lives lost.
Personal accidents from the ignition of wearing apparel	14	—	14
" " intoxication	4	—	4
" " explosion of fireworks	1	—	2
" " " steam boiler	1	—	1
" " " fire-annihilator composition .	1	—	1
Firemen killed by falling walls	1	—	2
*Inability to escape from burning building, or killed in attempting to do so	5	—	7
	27		31

Of the personal accidents, some were of a peculiar character. The first of this description happened on the 16th January, in Wardour-street, when a Mr. Calder met his death from the ignition of naptha spirit, with which one of Holliday's lamps was being replenished; when the lamp was three parts filled, the spirit suddenly took

* Four of these cases were not within the districts of the Fire-escape Society.

fire, and igniting Mr. Calder's clothes, burned him so severely, that he expired five days afterwards in the Middlesex Hospital. At the very time this catastrophe occurred, an inquiry was pending before Mr. Wakley, the coroner, upon a young man who had been killed at Highgate, by the explosion of another of Holliday's lamps, while in the act of being refilled. At this inquest Mr. Holliday contended, that neither the spirit nor its vapour possessed any explosive property; but that question being referred to Dr. Scoffern, on behalf of the friends of the deceased, and to Professor Miller, on behalf of Mr. Holliday, those gentlemen found by experiment, that the vapour was not of itself explosive, but that, when mixed with atmospheric air in certain proportions, it became highly explosive and dangerous.

Another unfortunate and fatal accident occurred on the 29th July, at Wapping Wall, where a female was burnt to death while preparing an embrocation, containing, among other ingredients, spirits of turpentine, which boiled over, and filling the apartment with flame, caused the death of the manipulator. Melting beeswax cost another female her life.

The manufacture of fireworks has this year, as in the preceding, caused the death of two of the parties so engaged. This catastrophe took place on Sunday, October 3rd, in Rose and Crown-court, Moorfields, upon the premises of Mr. Holyhead. A terrific explosion took place in the evening, and two boys were so dreadfully burned, that they died in the hospital on the following day. At the coroner's inquest a verdict of manslaughter against Mr. Holyhead was returned, and he was tried thereon at the Old Bailey sessions. His counsel contended that there was no evidence to show that the prisoner had been guilty of wilful neglect, and the jury returned a verdict of not guilty.

The deaths from inability to escape from burning buildings, present many of the usual, and some of them unusually, distressing characteristics. The first of these took place on Thursday, January 29, in Welbeck-street, Cavendish-square, when a sheriffs' officer, named Webster, who had been put in possession of the premises on the previous evening, lost his life. The inmates of the house effected their escape through a trap-door in the roof, but the deceased being unacquainted with the premises, or being overpowered by the smoke, did not follow them as they expected, and his lifeless body was found in his bed-room, after the extinction of the fire. The origin of the fire was most suspicious; Mr. Werndly, the occupier of the premises, having effected a large insurance upon his furniture, of which he had employed an appraiser to take an inventory only three days before the fire. At the inquest upon the unfortunate deceased, twelve out of thirteen jurymen were unanimously of opinion, "That the deceased was burnt to death, but how the fire occurred there was not sufficient evidence to enable them to decide."

The next fatal fire of this class broke out at half-past three o'clock on the morning of Friday, April 2nd, in Moor-street, Soho, on the premises of Mr. Oakey. Before discovered, the fire had made such extensive progress as to cut off all possibility of escape by the staircase, and a neighbour, perceiving the danger of the inmates, ran to Golden-square for the fire-escape of St. James's parish; his application was, however, met by a positive refusal, the conductor coolly telling the applicant (Mr. Day) that Moor-street being out of his district, he could not possibly render any assistance. A similar application from a policeman met with a like refusal! The consequence was, that seven persons, including two young children, were precipitated into the street, three of them from a third-floor window, all of whom were more or less hurt, one of them, a foreigner, so seriously, that he died of the injuries received. The editor of the *Weekly Times*, commenting upon this transaction, observes, "A more brutal exhibition of cold-blooded indifference to the safety of human life was never made public. Until the Golden-square authorities can insure the safety of all around them from fire, it would be only humane and reasonable that they should allow the means at their disposal to be made available for the safety of their neighbours; but for their absurd prohibition as to 'the district,' seven persons might have escaped without injury. As it was, six were grievously injured, and one killed, by leaping from the windows. For this sacrifice, the machine-keeper and his employers are morally responsible, and we regret that they cannot be made legally so as well."

On Sunday, September 12, a lamentable fire occurred in Middlesex-street, Somers-town, at the house of Mr. White, linen-draper. Shortly before two o'clock in the afternoon the servant girl went into the shop with a lighted candle, when a large body of gas took fire, and instantly filled the shop with flames, which rapidly ignited its highly combustible contents. A person named Balham, with his wife and four children, who lodged on the second-floor were unable to descend the staircase; these parties, with the exception of one boy 3½ years old, effected their escape with great

difficulty from the windows. This poor little fellow was overlooked in the confusion, and after the extinction of the fire was found dreadfully burnt in the ruins.

Sunday, September 19, Rotherhithe was the scene of a sad calamity. Shortly before 1 o'clock, A.M., the firemen on board of the floating engine heard cries of "fire" and "save us," and instantly raised an alarm. A police constable arrived soon after, and found the premises of Mr. Hogg, ironmonger and ship-chandler, on fire, and heard some women screaming most piteously, apparently in the shop; thinking to rescue them, he broke open the door. While this was going on, a niece of Mr. Hogg leaped from the first-floor window with her face and hands much burnt. Mr. Hogg next precipitated himself from the second-floor window into a counterpane held for his reception, but his weight split it in two and he fell heavily on the stones, receiving such severe injuries that he afterwards expired in Guy's Hospital. The only other inmates, a female relative, and the servant girl, were never seen until their disfigured remains were dug out of the ruins after the fire was extinguished.

From this painful subject, however, turn we to one of a more gratifying description; the year just ended has to the *Royal Society for the Protection of Life from Fire* been one of great and important usefulness; during that period the Fire-escape Conductors have been in attendance at 254 fires, and have accomplished the rescue of fifty lives viz.:

			Lives save
March 9.	No.	40, Goswell-street	9
April 11,	„	120, Whitecross-street	2
„ 13,	„	15, Nassau-street, Middlesex Hospital	5
May 9,	„	2, Hoxton-square	3
„ 14,	„	34, Featherstone-street	5
June 15,	„	21, Nassau-street	4
„ 25,	„	152, Upper Whitecross-street	3
Aug. 27,	„	33, Whitechapel-road	3
Sept. 16,	„	16, Oxford-street	2
„ 20,	„	57, Back-church-lane, Whitechapel	4
Oct. 18,	„	4, Sherborne-lane, Lombard-street	5
„ 29,	„	29, Webber-street, Blackfriars-road	2
Nov. 11,	„	5, Lant-street, Borough	3
			50

At almost all these fires, the very prompt attendance of the fire-escape, and the skilful and efficient exertions of its conductors, were the theme of universal approbation. In addition to the fifty human lives thus providentially saved, much valuable assistance has upon many occasions been rendered by the escape-men. Thus, for instance, at the serious conflagration which destroyed the extensive premises, stock and plant, of Mr. Grimsdell, builder, in Bell-lane, Spitalfields, on the evening of Sunday, October 3. In a very short time after the alarm of fire was given, two of the Royal Society's Fire-escapes were in attendance. At that time the fire was raging in a large pile of timber in close contiguity to the stable, the door of which was on fire, and within were eleven fine horses. Conductor Wood (Whitechapel station) perceiving the imminent peril of these animals, immediately went round to the back of the premises, and forcing out a window with his crow-bar set to work most vigorously to make an opening sufficiently large for the horses to come out of. With the assistance of Sergeant Price, of the Metropolitan Police, he succeeded in making an opening, through which all the horses and harness were rescued amid the cheers of the bystanders. The only matter of regret is, that neither the humanity thus displayed, the extraordinary exertions made, nor the value of the property saved from destruction, ever obtained from Mr. Grimsdell, or the Insurers (the Lancashire Fire-office) the smallest mark of gratitude for the services rendered upon this occasion by the Fire-escape conductor, and the Police-constable. During the past year six new stations have been provided with Fire-escapes; viz.,

The New-road, corner of Albany-street.

Camden-town, in front of the Southampton Arms.

Oxford-street, corner of Dean-street.—[This station was enabled, soon after the fatal fire in Wood-street, to provide for the safety of the inhabitants of that neighbourhood.]

Oxford-street, corner of Connaught-place.

Westminster, Broad Sanctuary.

Westminster, Horseferry-road.

Making the present number of Stations thirty-eight.

Other stations have been decided upon,

and only wait the completion of local arrangements for their adequate support. As the want of such aids becomes felt in various districts, and the inhabitants are willing to provide sufficient funds, the Royal Society are prepared to go on extending the sphere of their usefulness until the whole of this vast metropolis is protected by a continuous chain of Fire-escapes, at half-mile intervals, attended nightly by a properly-appointed Conductor, skilled in the use of his machine, and prepared to render all needful assistance in case of fire.

[We regret to be obliged to reserve a large portion of Mr. Baddeley's interesting article for our next Number, including his tabular analysis and of the occupancy of that portion of the premises in which the fire originated; and the comparative liability to accident by fire of the various trades, manufactories, and private dwellings.]

PROGRESS OF THE NEW CRYSTAL PALACE.

NOTWITHSTANDING the extremely unpropitious weather, which has prevailed for so long a time, operations in Penge-park, the site of the new Palace, have been proceeding with great vigour, under the direction of Mr. Henderson; and the principal local difficulty, which for so long absorbed the bulk of the labours bestowed upon the edifice,—from the rapid fall of the ground in the direction of the railway—has been at length totally surmounted. At present but a small portion of the western end is all that remains to be roofed and covered in at that part of the structure, and this is so near completion, that within a week or so the weather will be completely excluded. As regards the general interior, everything is in an extremely forward state; though the details of construction are so exceedingly numerous, and their mutual adaptation requires to be so perfect, that notwithstanding the energy of the contractors, and their well-known ingenuity and success in devising mechanical expedients for the economy of time, there appears to be little prospect of the Palace being opened punctually on the 1st of May. On the eastern half of the building a great advance has been made, both on the northern and southern sides of it, nearly all the columns having been erected. The extreme eastern end is now rapidly progressing, this portion having been left incomplete during the progress of other portions. In the nave and transept, some of the circular ribs, which form the figure of their arched roofs, have been put into their places at the west end; and when a few steam engines, in course of construction for facilitating and hastening this process, have been completed, this portion of the work will proceed with greater rapidity. These ribs are metallic, and are raised in pieces. A great deal of the gallery flooring has been laid down, and about one-half of that on the ground-floor, while the "ridge-and-furrow" roofing is completed over half the flat glazed surface. The staircases have also been commenced; their foundations having been laid, and portions of their framework adjusted, and a great length of gallery railing has been fitted.

There are a few points well worthy of notice in the progress of this structure, as they serve to show that, during the short interval which has elapsed since the first of its kind attracted the observation and the admiration of the world, the designer and the manufacturer have contributed to render these houses of iron and glass susceptible of all varieties of elegant form, and still more perfect in point of construction. We understand, in the first place, that the roofing is perfectly water-tight; of which an ample test has been afforded over the very large glazed surface which has been exposed to the recent severe weather. Great strength is given to the building, and greater convenience afforded for the manipulations of the glaziers, by the employment of wooden girders, which span the ridge-and-furrow roofing. With this addition, such an accident as happened in the Hyde-park building in the winter of 1851-2 cannot possibly occur. An additional source of strength arises from the use of heavier glass, that now used being 21 ozs. instead of 16 ozs. the square foot. As the building will be higher on many points than that in Hyde-park, and greater weights will be occasionally concentrated, the foundations have received especial attention, and in places exposed to extraordinary pressure, the use of strong intermediate bearing-columns has been resorted to. Thus the new building, in point of statical equilibrium, will be proof everywhere, on the most extravagant supposition of the amount of strain to be imposed upon the columns. As a general rule, the weight thrown on the girders will probably be something less than was the case in the old building; and on referring to the Table which we published in a recent Number, of the proofs to which various classes of the girders are submitted in the proving-machine, we presume an ample confidence would be placed in the strength of each bearing-part of the vast structure.

In the details of operations at Sydenham,

a great deal of method is observed, and many of them go on simultaneously with a rapidity and a regularity which are truly astonishing. The practice at Hyde-park, perfect as it was considered at the time,—having reference to the novelty of the structure, the multiplicity and extent of its details, and the shortness of the period allotted for its completion,—has been very much improved upon here; and this vast work is proceeding under the influence of a still more highly organized division of labour, and of more numerous mechanical adaptations. Here, for instance, as soon as the columns and girders are up, the window-framing for the adjacent parts of the roof and sides is put up, and the glazing and colouring are finished off at once. The highest tier of columns is only accessible by means of ladders; but the sash-bars are framed, nevertheless, without difficulty. It is intended that there shall be no inner gallery round the nave, as was the case in the old building. This will simplify operations to a considerable extent, and the effect of the interior to the eye will doubtless be all the better for the change.

At each end of the building there is to be a wing and a glass tower, from which a magnificent view will be obtained. As yet, these have not been commenced. They will occupy some time in their construction, and this, added to other retarding causes, fairly attributable to the extremely adverse weather which has so long prevailed, will, we fear, prevent the possibility of the Palace being opened at the assigned time.

GRIFFITHS' PATENT SCREW PROPELLER.

A SERIES of experiments has recently been instituted, at Portsmouth, with the royal yacht *Fairy*, for the purpose of testing the performance of Griffiths' propeller. In No. 1521 of the *Mechanics' Magazine*, we gave a detailed description, with figures, of this invention, the principal feature of which is its central sphere or ball, and an arrangement whereby the pitch may, within certain limits, be altered at pleasure. Experiments made with screws of the ordinary principle of construction,—that is, the blades of which become smaller towards the driving shaft,—show that the centre part absorbs a considerable proportion of the power, without having any propelling effect, in consequence of that part of the blades, particularly in coarse-pitched screws, being nearly in a line with the shaft; the effect being, when working, to hurl the water off by its centrifugal action at right angles to the shaft, thus seriously disturbing the more solid water upon which the effective part of the screw should act. The vibration at the stern of most screw vessels is attributed in a great degree to the flatter portion of the blades, in their downward course, striking the denser water below them, which offers a greater resistance than the water above the blade. The central ball of the new propeller is intended to cover this portion of the screw blades, or is rather substituted for the central third portion of the screw. It will be seen that the power required to revolve this sphere in the water at a great velocity is small compared with that of driving the comparatively flat blades of the same diameter. The strength of the screw is much increased by this form, which also affords great facility for replacing the blades in case of accident, to which screw vessels are particularly liable.

The new propeller on Griffiths' principle has been made for the *Fairy* by Messrs. Swayne and Bovill, and some excellent results have been obtained with it. In making the comparison between these and others with the ordinary, or Smith's propeller, it must be borne in mind that the *Fairy* is considered the best screw steam vessel in Her Majesty's service, and that her present state of excellence has been obtained after trying for the last few years every kind and form of screw. The one used in the present trial against the new propeller was a fine polished brass one, and considered the perfection of a screw. The new propeller was simply a cast-iron one, and the first attempt made against the *Fairy's* screw.

Having shipped her new screw on the graving-slip, the *Fairy* went out on two experimental trips during the second week in last month, under the direction of Captain Crispin, the second in command of the royal squadron. On the first occasion, she made 13 runs along the measured mile at Stokes Bay with various pitches of the screw, a strong southerly breeze blowing, the results of which were highly satisfactory,—the mean speed to-day being 12·557, with a 7 feet pitch; the speed with the ordinary screw being 12·100. The diameter of Griffiths' screw tried was only 5 feet 10 ins., with which these results were obtained. In the interval between the two experiments the *Fairy* had the other set of blades, of 6 feet 4 inches diameter, fitted, which brought the diameter to within two inches of the *Fairy's* own screw.

The following Table exhibits the circumstances and results of the second days' experiments at the measured mile in Stoke's Bay. In both sets of trials, that is, with the ordinary and with Griffiths' screw, the draught of water was 7 feet aft and 5 feet forward:

WITH THE COMMON SCREW.

Trials.	Revolutions of Engines.	Pressure of Steam.	Vacuum Inches.	Time. min. sec.	Knots per hour.	Average knots per hour.	Pitch of Screw.
		lbs.					feet
1. With tide	38½	11	26½	4 49	12·456	12·248	8
2. Against......	38½	11	—	4 59	12·040		
3. With tide	38	11	—	4 57	12·121	12·000	—
4. Against......	38	11	—	5 3	11·880		
5. With tide	38	11	—	4 49	12·456	12·053	—
6. Against......	38½	11	—	5 9	11·650		
Total average mean speed per hour in knots						12·100	

GRIFFITHS' PATENT PROPELLER.

Trials.	Revolutions of Engines.	Pressure of Steam.	Vacuum inches.	Time. min. sec.	Knots per hour.	Average knots per hour.	Pitch of Screw.
		lbs.					feet.
1. With tide	30	11	26	4 57	12·121	11·738	10
2. Against......	30	11	—	5 17	11·356		
3. With tide	33½	11	—	4 34	13·139	12·057	9
4. Against......	33	11	—	5 28	10·975		
5. Slack water ..	37½	11	—	4 51	12·371	12·392	8
6. Slack water ..	37	11	—	4 50	12·413		
7. With tide	41½	11	—	4 23	13·688	12·631	7
8. Against......	42½	11	—	5 11	11·575		
Total average mean speed per hour in knots......						12·205	

Thus it appears that, when the screw was put at 10 feet pitch, the engines could only make 30 revolutions per minute. Notwithstanding this great reduction in the power employed, the mean speed of the vessel actually obtained was 11·738 knots, only a quarter of a knot less than was obtained with the *Fairy's* best screw; 12·100 knots, with engines running 38½ revolutions per minute; thus saving in power, wear and tear of machinery, and fuel. When it was desired to increase the speed of the vessel, the pitch of the new propeller was diminished, the revolutions of the engines regularly increasing with every reduction in the pitch, and at 7-feet pitch the engines made 42 revolutions per minute, and the mean speed of the vessel reached 12·631 knots per hour.

During these experiments on board the *Fairy* the pitch of the new propeller was repeatedly altered to test its effect, and so simple is the arrangement for doing this that the alteration only occupied three minutes on each occasion. It will be seen by the Tables that with the new propeller the engineer can control the speed of his engines at pleasure by increasing or reducing the pitch of the screw, so that in a fair wind, by increasing the pitch, the full power of the engines working only at the proper speed may be exerted in effectively propelling the vessel, instead of consuming fuel for driving round the engines (with a fine pitched screw) to no good purpose. In going head to wind, it is only necessary to reduce the pitch, by which the engines will be made to give out their utmost duty with a certainty of effectually propelling the vessel; and in cases where it is desired to economise fuel as much as possible, the pitch of the screw may be increased to reduce the revolutions of engines to any extent. The advantage of being able to alter the pitch of a screw is certainly very great. So difficult does it appear to be for even the most experienced engineers to determine for different vessels the correct pitch of the screws, that it is customary in the navy to construct the second or spare screw, which every vessel carries, of a different pitch to the other; and it seems to be quite a matter of accident

whether one or the other is the best pitch for the ship.

With regard to the uses and incidents of the central ball in Griffiths' propeller, it may be stated that it gives additional strength, and affords the opportunity of constructing within it the very strong, and at the same time simple and effective arrangement for altering the pitch and feathering the blades parallel to the shaft when the ship is under canvas only, to which so much importance has lately been attached in reference to the Australian and East India steamers. In the case of the fracture of one of the blades of the screw, the patent propeller is readily repaired by shipping a new blade; but with the ordinary screws, which are cast in one piece, the breaking of any part is fatal, and involves the necessity of making a new casting. Simple as the difference may appear, it is not unimportant in large vessels with brass screws, weighing from 8 to 10 tons, and now worth about 200*l.* per ton.

THE TRADES OF BIRMINGHAM.

The Japan, lamp, jewellery, trinket, screw, and pin trades are all in full work. The only drawback in general business during the present week, besides that of the advance in the price of metals, and which in one particular branch has operated injuriously, has been the destruction of the extensive manufactory of Mr. J. C. Onions, the bellowsmaker. A large business and most important export trade was thus for a few days suspended, but it is now pretty nearly resumed, and the numerous hands employed by Mr. Onions are, or in a few days will be, in full work.

At a conference of the flint glass manufacturers, held at the Stock Hotel (according to a circular issued by Messrs. Harris and Son), it was resolved that an advance of not less than 10 per cent. should be made on the present selling prices of plain, coloured, and cut glass, without reference to a general list of prices. This rise is attributed to the advances which have of late occurred in fuel and other materials consumed in the manufacture of glass. It is peculiar that the sand, which forms so large an ingredient in the composition of glass, has also been advanced in price.

At the beginning of the week, the metal-dealers issued circulars, announcing another advance of 2*l.* per ton in the price of tin, the quotations being from 5*l.* 18s. per cwt. to 7*l.* The price of copper also advanced to 139*l.* per ton, and at this enormous price orders would not be accepted, except for immediate delivery. Many of the "small masters" have been obliged to close their workshops, and nearly every house in the brass and tin trade has issued circulars, cancelling all existing orders and discounts. The agents of some of the Russian mines have offered to supply some of our large consumers on advantageous terms, as soon as the rivers in that country will permit of its transmission. The important discovery of copper at the Roylage mine in Staffordshire has just been announced, and this, with the promised supply from Russia may, it is hoped, check the ruinous monopoly now being carried on in the trade.

The demand for Australia is unabated, and revolvers are bought up as fast as they can be turned out of the manufactories, regardless of price. A considerable number of iron houses are being prepared for emigrants about to start, and there can be little doubt, when landed at their destination, they will give rise to extensive orders for similar habitations. They are exceedingly light, durable and commodious, and must be of inestimable advantage in Melbourne and other places, where it is now said to be all but impossible to procure a night's lodging under the shelter of a house of any kind. The gun trade is exceedingly brisk, the best understanding exists between the masters and men, and both are reaping a good harvest from daily increasing orders.

The railway carriage manufactories are engaged with extensive continental and other orders. At the Saltley-works, belonging to Messrs. Wright, several hundred pairs of hands are busily employed, and the greatest activity prevails at the extensive works of Messrs. Brown, Marshall, and Co. This firm is at present executing contracts for carriages for railways in the Brazils—chiefly first-class—and constructed upon an improved principle. Several hundred tons weight of iron-work for India is also being prepared and forwarded to its destination, intended for the construction of goods wagons and other railway carriages. A contract for 100 goods wagons, on Henson's patent, has recently been entered into for the Great Western Railway Company, who require them for the traffic upon their new branch of railway to Birmingham. Carriages are also being made for the Valentia Railway in Spain, and a large number of wagons for the Midland and South-eastern Companies are in course of manufacture, exclusive of some large contracts for Ireland and Scotland.

THE IRON TRADE.

South Staffordshire.—The iron trade of South Staffordshire continues very active, and the prices last adopted are steadily maintained by the leading firms, although

smaller makers are selling at rates somewhat lower. There is a great demand for plates, bars, and rails. An authority in such matters states that "the iron-masters' books were never so full of orders, and it is impossible to execute them satisfactorily for want of fuel and a sufficient quantity of hands. The pig-market is still dull, and speculators cannot effect sales satisfactory at present prices; but as the quarter is far advanced fresh contracts must be made by the iron manufacturers for pigs for the ensuing quarter."

It is stated that the late speculators in pig-iron, which had the effect of raising the market in so extraordinary a degree, were transacted chiefly by bills, and not in cash, and these bills having (or about) become due, large quantities of iron are necessarily thrown upon the market. This is among the rumours which find circulation in the iron districts. There are other reasons why the price of pigs should at the present time have a tendency downwards. There is a disposition manifested by some of the great manufacturers of iron to hold out for still further reductions in the prices of pigs, and needy men are obliged to give way. There are many pigs yet to be delivered at less than 3*l.* per ton, owing to contracts which were made five or six months ago. Nor, it may be mentioned, is the almost superabundance of work observable in the contiguous iron districts all done at the immense profits some imagine. Mr. Ellis disclosed the fact at the meeting of the Midland Railway Company at Derby, that the Directors had contracted for laying down heavier rails upon their entire line, not at the present advanced price (say, in so heavy a contract, 10*l.* 10*s.* or 11*l.* 11*s.*), but at the rate of 6*l.* 10*s.* per ton. There are many other similar old contracts, but not to the same extent, in course of execution in these districts, as well as in Wales and Scotland.

Glasgow Pig Iron-market—Glasgow, Feb. 26.—Our pig iron-market has been inactive during the past week, and the business chiefly confined to sales for shipment and consumption. On Monday an attempt was made to force up prices, with little success, for although 57*s.* to 57*s.* 6d. cash for warrants was reached, the price immediately declined without much iron changing hands, and to-day the quotations are those of last Saturday—viz., warrants, 55s. cash; No. 1 gmb., 55s. 6d.; No. 1, Gartsherrie, 56s. 6d., against bill of lading.

America.—By the *Times'* letter from San Francisco, dated on the 15th of January, we learn that the current prices of boiler-plates was 4½c. to 5c. per lb., bar-iron 4 c. to 4½c. per lb., and pig-iron 27c. to 28c. per lb.

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair. The Paper read was "On the Increased Strength of Cast-Iron, produced by the use of Improved Coke." By Mr. W. Fairbairn, M. Inst. C. E.

The Paper commenced with a communication from Mr. Crace-Calvert, on the subject of an improved system of depriving the fuel, whether used in blast furnaces, or in re-melting cupolas, of the deleterious substances, by which the quality of the iron was deteriorated; or of the adaptation of the system to blast furnaces, when using coal for smelting iron ores.

The object was chiefly to point out what were believed to be the causes of the inferiority of iron, in many works, apart from the varying qualities of the ores.

These were stated to be the introduction and application of the hot blast, which had enabled the iron-master to reduce into cast and malleable iron a very large per centage of cinders, slag, and other impurities, containing large proportions of silicate of iron, sulphur, and phosphorus, all of which tended to destroy the tenacity of the metal, and to render it either "red short" or "cold short"—and also, when sufficient attention was not devoted, by those who were entrusted with the regulation and charging of the blast furnaces, to the chemical composition of the ironstone, by which the relative proportions of the flux and fuel employed in its reduction should be regulated; the chemical composition of the limestone or the coal not being sufficiently known, these materials often varying in quality as much as the ironstone itself—the iron smelter was unable to tell, with certainty, the quality of iron which his furnace would produce; and instances had occurred where a siliceous ore had been used for three or four hours successively, and then at once it had been replaced by an aluminous and sometimes by a calcareous ironstone, without the change being made in the proportions of limestone, or coal, which was evidently required by the different qualities of those ores.

The following analysis exhibited the different quantities of silicium existing in cast-iron:

White Crude.	Monkland.	Coltness.	Eglinton.	Dalmellington.
0·18	1·53	2·69	3·12	4·42

The injurious action which an impure fuel had upon the quality of the iron, was particularly alluded to; and the necessity of removing the sulphur from the coal or coke when employed in the blast furnaces, before it could be imparted to the cast-iron during the process of smelting, was strongly enforced. The difference in the quality of iron smelted with coal, and by the application of a process which had been recently introduced by Mr. Crace Calvert, of Manchester, compared with iron smelted in the ordinary way, was exhibited in the following analysis:

PROPORTIONS OF SULPHUR.

Eglinton Pig Iron.	Melted in the Cupola with ordinary Coke.	Melted with improved Coke.
0·336	0·281	0·191

The following Table showed the improved quality of iron, after the application of the chloride of sodium in the blast furnace; by which the proportion of sulphur had been diminished:

Monkland without Chloride.	Monkland with Chloride.	Dalmellington without Chloride.	Dalmellington with Chloride.
0·690	0·150	0·956	0·218
And the increased bearing weight of 1-inch bars, cast from these irons:			
579°	·627°	487°	556°
576°	655°	456°	525°
		487°	544°
		470°	562°
			569°

These improvements were described to have been effected, at a very small cost, by the following simple process. If the blast furnace was worked entirely with coal, chloride of sodium was added, with each charge, in proportion to the quality of the ore and flux employed; but a better result was produced, if the coal was previously converted into coke, and an excess of the chloride was used in its preparation, in order to act on the sulphur of the coal, and of the ore, should any be found therein; and a greater improvement was manifested, in the quality of the iron, when only coke so prepared was used in the blast furnace.

The coke, so purified, emitted no sulphurous fumes, when taken out of the coke-oven, nor, when extinguished with water, did it give off the unpleasant odour of sulphuretted hydrogen, nor was there any sulphurous acid gas liberated, during the operation of smelting iron in the cupola, or in raising steam in the locomotive boiler, by coke so prepared; and it was stated, that these decided advantages were gained, in some cases, at an additional cost of only one penny per ton of fuel.

The chemical action of the chloride of sodium was thus described: When coal was first subjected to heat, in a coke-oven, the bisulphuret of iron, contained in the coal, was decomposed into sulphur—which latter was distilled, or burned; and also into proto-sulphuret of iron, which remained in the mass, and was acted upon by the chloride of sodium, as it was volatilized at a red heat; thus chloride of iron and proto-sulphuret of sodium were produced. Then a second chemical re-action ensued; the proto-chloride of iron was decomposed into a sub-per-chloride of iron, and the chlorine gas, thus liberated, reacted on the sulphuret of sodium, giving rise to chloride of sodium, and to chloride of sulphur, which latter was disengaged—so that the prepared coke contained less sulphur than the ordinary coke; but admitting even that a small portion remained, it would be in the state of sulphuret of sodium, which would not yield any of its sulphur, during combustion, but passed into the cinders of the blast furnace, or of the cupola, and into the ashes of the fire-box in the locomotive, thus preventing the injurious effects of the sulphur on the fire-bars and the copper of the fire-box, and on the brass tubes of the boiler of the locomotive; and the sulphur, thus fixed, did not enter into combination with the iron, preventing crystallization during the process of smelting, and giving greater tenacity and closeness of texture both to the cast and to the malleable iron.

The second part of the Paper gave the results of a series of experiments, which had been made by Mr. Fairbairn, upon trial-bars one inch square, cast from iron

melted in the cupola, with coke, prepared by the process of Mr. Crace-Calvert, and exhibited specimens of the iron so prepared, when the closeness of texture and the absence of the "honey-comb" appearance, prevailing in the iron cast with the ordinary coke, was clearly demonstrated. The mode of experimenting was described, and the results were given very elaborately, and it was shown that the average increase of strength was from 10 to 20 per cent.

Taking the mean of the whole experiments, the following conclusions were arrived at:

	lbs.
The mean breaking weight of the bars per square inch, melted with the improved coke, was	515·5
Ditto ditto with ordinary coke.	427·0
	=88·5

in favour of the castings produced from the improved coke, or in the ratio of 5 : 4.

The experiments on the bars smelted with the improved coke, indicated iron of a high order as to strength, and might be considered equal to the strongest cold blast iron; the metal appeared to have run exceedingly close, and exhibited a compact granulated structure, with a light grey colour.

The following Paper was announced to be read at the meeting of Tuesday, March 8th, "Experimental Investigation of the Principles of Locomotive Boilers," by Mr. D. K. Clarke (Edinburgh).

The Engineer and Machinists' Drawing-book; a complete Course of Instruction for the Practical Engineer, on the basis of the Works of M. Le Blanc and MM. Armengaud. Blackie and Son.

By the mechanical and engineering profession, which has derived so much benefit from the excellent publications of the Messrs. Blackie, the value of this treatise on mechanical drawing will be readily appreciated. The entire work having advanced far towards its completion during several years of preparation, the first part has at length made its appearance, and cannot fail of realising the expectations of those who knew it to be in the press. As indicated in the title-page, the work is based upon those of M. Le Blanc and the MM. Armengaud, which have attained a deserved reputation in France for their judicious selection of subjects of illustration, and their equally judicious arrangement, by which an easy gradation of study is attained. The excellence of these works for the purposes of instruction cannot be more highly attested than by the fact that they have been made the basis of a course of instruction by men of great knowledge, and undoubtedly extensive experience of the subject, in this country; not only by the editor of the work before us, but by that of another publication, of which we lately took notice in the *Mechanics' Magazine*, and which was, to some extent, a translation of the French. Though quite concurring in the value of the originals, and admitting generally the superior character of French books on sciences intended for study, we must be permitted to express our surprise, that a work on the same scale, embracing the entire circle of the graphic art, should not be originated by Englishmen, in the English language, and illustrated by examples from English sources. Of all countries in the world, England is the one in which the greatest demand exists for the skill of the draughtsman; England is the one in which that skill is directed to the representation of the greatest variety of subjects; and England is the one in which mechanical drawing is most successfully cultivated. So happy a conjuncture of circumstances for producing a great work of instruction on this subject, would induce the idea, that our own literature would, at the present day, usher one into the world. This has not been the case so far; but in a practical point of view, considering how eminently useful the works of French writers are for directing the study of design-drawing, we are quite ready to allow our national pride to give way to expediency, and freely take, and freely acknowledge the means which our continental neighbours have placed at our disposal.

The plan of the "Engineer and Machinists' Drawing-book" is extremely simple, and carried out with great ability and judgment. Its general object is to teach the method of representing machinery with effect and truth, to point out the methods by which their most complicated parts can be constructed geometrically, and finished artistically, and to facilitate the comprehension of figure of all kinds, when placed in positions not readily described. To begin at the beginning of the subject,—there is an introduction devoted to the construction and use of drawing instruments, with a substantial grounding in the principal geometrical theorems and problems which are of most frequent application in practice. This elementary instruction, so to speak, includes the ex-

planation of the most modern and improved mathematical instruments, with exercises upon them, and accompanied with useful remarks on drawing and drawing instruments. An abundance of examples is given exhibiting the projection, or outline delineation of solids, and illustrating the method of working and setting out by centre lines. Elementary subjects in variety are also illustrated, accompanied with copious and clear instructions for drawing eccentric cams, toothed wheels, and other gearing. Complex machinery depending upon continuous or reciprocating motion, follows in its proper order, as a sequel to the foregoing instruction upon details. One section is devoted exclusively to hand-sketches taken from actual machinery, of which some examples are given, to show the method of making finished drawings from them. The true projection of shadows, and general shading, and also a comprehensive course of instruction in the highly important subject of perspective, are included in this comprehensive treatise.

The engravings are exceedingly numerous, and are beautifully executed on steel. Those in the part before us contain examples of the orthographic projection of pyramids and prisms, the projection of a single-threaded triangular screw, and of a bevel wheel, and also, as the first of a series of examples of machinery, a fine engraving, on a large scale, of a 6-horse high-pressure-engine. The letter-press gives the description of the uses and geometrical principles of construction of the drawing instruments, with ample instructions for practice. The work is to be completed in about fourteen parts, each of which will contain four and five plates alternately. For the number and judicious selection of its examples, we have great pleasure in recommending it to our mechanical readers.

A Summary of the Law of Patents, and of Extension of Patents; with Forms, and all the Statutes. By CHARLES WORDSWORTH, Esq., Barrister-at-law. W. C. Benning and Co.

NEXT in importance to a simplified patent-law is certainly a simplified statement of its nature and practice, exhibiting concisely, yet clearly, the history of the subject, and gradually tracing the changes which have in the lapse of time brought to our courts of law the settlement of questions of monopoly which once was vested wholly in the prerogative of the crown. The true principle of these grants is in this way made more plain than it possibly could be from mere reference to stereotyped forms of proceeding, and the patentee is better enabled to comply with the most rigorous requirements of the law, in explaining his invention and defining his rights. At the present time, when the Patent Law Amendment Act of last Session has given so great an impetus to invention and experiment in every one of our manufactures and processes, a book of this kind is more called for than ever. Since that long-desired statute came into force, on the 1st of October last, no fewer than 1,700 provisional protections have been obtained; and, judging from the indications which present themselves on all sides of the activity of the inventive faculty, it is highly probable that still more rapid additions will be made to our register. Greater precision, therefore, as a general rule, is now necessary in the preparation of patent documents; for without it there will be nothing but a conflict of claims and of interests.

Those who have had the experience of a patent office, will readily bear witness to the extreme convenience to patentees of such a popular exposition of the law of patents as we have now before us. Questions constantly arising in the minds of intending patentees are here found simply answered. The possibility of obtaining a patent for a given invention, the extent to which the specification should describe the method patented, the mutual relation of the title and the specification, the claims and disclaimers which should be set forth—these and a host of details of minor importance, which add to the anxiety of the patentee, and not unfrequently entail failure upon his undertaking—are motives which he should understand at once individually. And in relation to the entire business of suing out his patent, the arrangement of Mr. Wordsworth's excellent summary of the Patent Law is admirably calculated to put the reader in full possession of the entire subject, at the expense of an hour or two's careful reading. It commences with a brief but accurate retrospect, extending to the period when the practice of granting monopolies for inventions first presents a distinct origin, and bringing the reader up to the present state of the subject, as depending upon the recent statutes, and the course of modern decisions. In the subsequent sections, the business of obtaining, defending, impeaching, and extending letters patent, and the numerous matters incidental to each of these subdivisions of the law of patents, are developed in their natural order of succession. First of all,

we have a full explanation of what persons may obtain a patent, and of the subjects for which one may be obtained. The latter point, especially, is one of great importance, with reference to which fatal misapprehensions very commonly exist. A number of authorities are collected to illustrate this section, which is one of the most valuable in the book. Following the subject farther, we come next to the method of obtaining a patent, every step of which is clearly laid down, and every caution given which the present state of the law suggests. The next section includes the form and operation of patent-licenses; after which comes the important business of preparing the specification. To this part of the subject the author has properly devoted a very great deal of attention; and he has succeeded in presenting it in a form which, while it is not rendered defective by the unnecessary use of technical expressions, appears to have omitted nothing of practical importance, and leaves little to be desired by intending patentees, and those who are professionally concerned for them. In the remaining sections the general subject is carefully treated in detail. Disclaimers, caveats, infringements, costs, injunctions, the avoiding of letters patent by *scire facias*, the registration of patents and of proprietors, and the prolongation and confirmation of patents, are fully gone into in a convenient arrangement under sections.

A very great number of cases, the references to which are stated, are given as contents in each section, which show at once the practical value of the book, and the research which has been employed in producing it. An Appendix, containing all the important statutes, and a collection of forms, completes the work, which on all these accounts must prove of the greatest service to every person concerned in the preparation, working, or conducting of patents.

THE COTTON MANUFACTURE.

The concluding Lecture of the series "On the History, Trade, and Manufacture of Cotton," was delivered by Mr. Frederick Warren, at the Society of Arts, on Thursday evening last. Having in the preceding lectures explained the nature of the plant from which the fibre was obtained, the mode of treating the fibre, and of producing from it cotton cloth, Mr. Warren now proceeded to describe the manner of bleaching the fabric, so as to render it fit for the operations of the calico-dyer and printer. The old plan of bleaching consisted in submitting the cloth to the action of water filtered through wood-ash, and afterwards exposing it to the atmosphere. This was a tedious process, and occupied many months. Scheele having discovered the power of chlorine, Berthollet, a French chemist, made a number of experiments, and ascertained that it was capable of abstracting the impurities of, and depriving the cotton cloth of its colouring matter. The first practical application was made by a Mr. MacGregor, of Glasgow, who used chlorine in conjunction with sulphuric acid. This, however, produced so offensive an effluvium, that chemists continued to experiment, until it was found that by mixing lime with oxy-muriatic acid, the objectionable smell was removed. These improvements had reduced the cost of bleaching from fourpence a yard to three-halfpence, or one penny three farthings a piece of 30 yards. After the material had been thoroughly bleached, it had to be prepared for receiving the colouring matter, which consisted in the application of a peculiar kind of mordant, according to the colour required; and this entering the fibres of the cotton cloth, rendered it susceptible of the action of another chemical, which, though colourless in itself, produced, by combination with the mordant, the exact shade required. Whilst explaining the process, Mr. Warren performed the whole of the operations described, thus rendering the effects he had alluded to visible to the meeting. The old plan of laying on the colours by hand, the substitution first of wood blocks, then of combining with the wood metal points and lines, so as to increase the fineness of the work; and now of the copper cylinder printing machine were next enumerated, and the mode in which the pattern was impressed on the cylinder was very lucidly explained. The last improvement in block printing was burning out the pattern, previously drawn on a wood block, with fine points, and then pouring soft metal into the matrix so formed, the body of the pattern being afterwards filled in with felt, which, by readily absorbing and delivering the colour, gave a greater depth, precision, and evenness to the design.

On the mornings of Tuesday and Friday a number of the scholars and pupils of King's College, accompanied by their masters, visited the Society of Arts, to receive from Mr. Warren an explanation of his machinery illustrative of the cotton manufacture, and an account of the processes involved in dyeing and calico printing, with all which they appeared highly gratified.

INGENIOUS MODE OF COLLECTING ICE.

We were pleased the other day at witnessing an ingenious and novel application of an old and well-known principle in some pleasure-grounds at Matlock Bath, and think the plan might be usefully imitated in some situations where ice is desirable—a fall of water attainable—but ponds and reservoirs at an inconvenient distance. It is well known that when the thermometer is at or below 32°, on freezing, that, especially with a brisk wind, a fine jet of water, forced by pressure through a small punctured aperture into fine spray, falls to the ground in the form of powdered ice. An accidental leakage in a water-pipe, a few years since, drew the attention of the gardener at the pleasure-grounds named, to the fact that a considerable quantity of ice had collected from the one small fracture in the course of a single night, and the following day he improved on the hint by suspending a leaden pipe at a height of nine or ten feet from the grass, in the open air, in a northwardly aspect, the pipe being filled with water from a head considerably higher, and punctured with holes made with a fine awl blade. The result was as anticipated, ice formed continuously and rapidly, and, the frost continuing a few days, crowbars were required to remove the blocks which had accumulated on the grass; and every bush, shrub, or other substance within the reach of the showers of spray was coated in the most fantastic, beautiful, and grotesque forms. Ice is freely used through the summer by the gentleman owning the grounds; and although there is no sheet of water that will freeze within a moderate distance, still, if any frost happens in the course of a winter, there is nothing but seizing the right moment required to fill the icehouse with solid and durable ice.—*Derby Courier.*

M'FARLANE'S GOLD-WASHER.

The following method of separating gold from the *débris* and other foreign matters associated with it in its native state, has been communicated to us by Mr. Peter M'Farlane, of Comrie, Perthshire. As it appears to be extremely simple, and eminently adapted for many situations in the auriferous districts of Australia and California, if not as a final, at any rate as a preliminary process, we give the following description of it. It will be seen that in common with other plans for a similar purpose, it proceeds upon the well-known principle, that when small bodies of different specific gravities are thrown into a fluid, the heavier ones descend the most rapidly, and reach the bottom first. In devising this process, the inventor has applied that principle with great ingenuity, and probably it would be found in practice with great success.

The apparatus consists of a tank 14 or 15 feet deep, and of any convenient width, which is filled with water. By means of small horizontal slits in one pair of opposite sides of the tank, and corresponding grooves in the other, two sheets of iron can be introduced or withdrawn till they rest in the middle on a moveable cross-bar. There is a false bottom exactly fitting the tank, which can be let down by means of ropes till it rests upon the true bottom. The moveable bottom is perforated like a sieve, so that the water flows freely in either direction through it. It has also low upright sides, capable of sliding down the tank. When this false bottom is lowered into the tank, and the mouth of the vessel shut by pushing in the iron sheets, a layer of the *débris* is spread over the lid or cover, which in that position they form, and then the sheets are instantly withdrawn. The *débris* then fall immediately into the water, and their particles sink in the order of gravity to the false bottom. This bottom is then raised, taken out of the tank, and covered with the two sheets that had lately formed the tank-cover. It is then inverted and lifted off the cover, when the gold will be exposed on the now upper surface of the *débris*.

SINGULAR DISCOVERY IN THE PRODUCTION OF SILK.

It has long been known to physiologists that certain colouring matters, if administered to animals along with their food, possessed the property of entering into the system and tinging the bones. In this way the bones of swine have been tinged purple by madder, and instances are on record of other animals being similarly affected. No attempt, however, was made to turn this discovery to account until lately, when Mons. Roulin speculated on what might be the consequences of administering coloured articles of food to silkworms just before spinning their cocoons. His first experiments were conducted with indigo, which he mixed in certain proportions with the mulberry-leaves serving the worms for food. The result of this treatment was successful—he obtained blue cocoons. Prosecuting still further his experiments, he sought a red colouring matter, capable of being eaten by the silkworms without injury. He had some difficulty to find such a colouring matter at first, but eventually alighted on

the *Bignonia chica*. Small portions of this plant having been added to the mulberry-leaves, the silkworms consumed the mixture, and produced red-coloured silk. In this manner the experimentalist, who is still prosecuting his researches, hopes to obtain silk secreted by the worm of many other colours.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MARCH 4, 1853.

Charles Butler Clough, of Tyddyn Mold, Flint, gentleman, J.P. *For certain improvements in machinery or apparatus applicable to the purposes of brushing and cleaning.* Patent dated August 19, 1852.

The patentee describes and claims—

1. An arrangement of apparatus for brushing and cleaning boots and shoes and metallic or other articles. This consists simply of a rotating brush driven by a cord passing over a pulley, which is turned by a winch-handle.

2. An arrangement for applying colour, varnish, paint, &c., to the surface of paper and various fabrics. This consists of a brush rotating in a colour trough, and a roller, against which the fabric operated on is held.

3. The application of India-rubber or other elastic material for forming the backs of the brushes, and for constructing the rollers used as above.

Samuel Nichols, of Coldham-street, Nottingham, mechanic, John Livesey, of New Lenton, draughtsman, and Edward Wroughton, of New Lenton, mechanic. *For improvements in the manufacture of textile fabrics and in machinery for producing such fabrics.* Patent dated August 19, 1852.

James Lowe, of Charlotte-place, Upper Grange-road, Bermondsey, mechanic, and Thomas Eyre Wyche, of George-street, Mansion-house, London, gentleman. *For improvements in propelling vessels.* Patent dated August 19, 1852.

This invention consists of a novel construction of propeller on the screw principle. The blades of this propeller, which may be two or in any other convenient number, instead of being portions of a screw are each composed of concave and convex surfaces, and are, in fact, twisted planes; their extreme outer edge does not, however, deviate from a straight line. They are cast in one, with or affixed to an oval boss, which is preferred to any other form, and are chamfered off at their edges so as to pass through the water with greater facility.

Claim.—A propeller with two or more blades, each with concave and convex surfaces, set on an oval boss, or cast in solid therewith, in lines or planes, as described.

Thomas Hunt, of Leman-street, Goodman's-fields, gunmaker. *For improvements in firearms.* Patent dated August 19, 1852.

The *first* part of this invention consists of improvements in the breech-loading firearm, commonly known as the Prussian needle-gun. The construction of the piece does not differ materially from that in general use, the improvements being principally confined to matters of minor detail. The lock, instead of being secured to the sliding bolt by a screw is held by means of the sear spring; the needle is projected, as in the ordinary form of this gun, by a coiled spring, but is secured in place in the lock by a stud taking into a groove on its head, there being a longitudinal groove in the needle to allow of its being brought at first into a correct position; the sliding bolt, instead of having its handle a fixture has it contrived so as to fold down against the side of the gun, and is held up against the permanent case in which it is situated, by a spring-catch instead of a screw; the trigger lever is placed at the back of the trigger, instead of occupying its usual position; and the permanent case of the sliding bolt is enclosed by a moveable cover, which can be turned round when required so as to protect the working parts from the access of rain, &c.

The *second* part of the invention has relation to double-barrelled guns, and consists,—1, in forming the breeches of such guns with a single "hut" intermediate of the breeches, instead of with two "huts," which is the common practice;—2, in an arrangement of apparatus for removing and fixing the breeches, in which the barrel is cramped between two surfaces faced with wood and screwed together, while the removal or screwing in of the breeches is effected by means of a screw acting against a lever, which embraces the "hut" on the end of the breech; and 3, in a safety-bolt for preventing the accidental discharge of double-barrelled guns. This bolt is attached to the rear end of the sliding-loop or trigger-guard, the ends of which work through slots in the guard-plate, and hold the triggers fast by taking into a notch formed on each of them, either at half or full cock. The bolt is released by applying a slight pressure to the front end of the loop, which withdraws the bolt from the notches in the triggers, and leaves them free to act on the lock-spring.

Claims.—1. The improvements in breech-loading fire-arms.

2. The method of making the breeches of double-barrelled fire-arms, and the

apparatus for removing and fixing the breeches.

3. The means of forming a safety-bolt.

HENRY SPENCER, of Rochdale, Lancaster. *For certain improvements in machinery or apparatus for preparing, spinning, or weaving cotton and other fibrous substances.* Patent dated August 19, 1852.

Claims.—1. The application of a bridge over which the material passes at or towards each end of tubes employed for twisting and consolidating fibrous materials in that class of preparing machinery known as Dyer's frames, and also for effecting the like operations upon such materials when proceeding from the carding-engine.

2. The application of a tubular weight within the bobbins of throstle spinning machinery.

3. An arrangement of endless tappets in conjunction with other parts and contrivances for shedding the warp in weaving.

4. The application of an outward coat of cement, varnish, or other like substance, at or near the joints of straps or bands used in preparing, spinning, and weaving machinery.

PIERRE ARMAND LECOMTE DE FONTAINEMOREAU, of South-street, Finsbury, Middlesex. *For certain improvements in cutting schistus for slates.* (A communication.) Patent dated August 19, 1852.

The patentee describes different arrangements of machinery for cutting roofing and other slates from large slabs or blocks. The cutting tools in all these machines act vertically in conjunction with guides and holders, and in some cases with drills for previously operating on the slabs. The cutters are formed in several pieces, toothed on their edges, and are worked by cams and rods, and act either on both sides of a slab simultaneously, or on opposite sides alternately.

Claims.—1. The peculiar arrangements of machinery for cutting slates for roofing and other purposes.

2. The mode of constructing and putting nto operation, either simultaneously or alternately, the cutting blades.

JOSIAH GEORGE JENNINGS, of Great Charlotte-street, Blackfriars-road, brass founder. *For improvements in water-closets, in traps and valves, and in pumps.* Patent dated August 23, 1852.

The patentee describes and claims,—

1. An improved construction of water-closet, in which the pan and trap are constructed in the same piece, and so formed that there shall always be a certain quantity of water retained in the pan itself, in addition to that in the trap which forms the water-joint.

2. An improved construction of valve for water-closets and other uses, and several arrangements of valves and other apparatus for like purposes. The novelty of the valve consists in its spindle being prolonged downwards, so as to be capable of being acted on by a lever which opens and closes it, and thus admits water without (in the case of water-closets) the use of wires, &c. The other arrangements include a similar valve, but provided with a waste-pipe, and an arrangement of the same with a ball-cock for governing the supply of water to water-closets and their cisterns; also an improved stand-pipe, and a sluice-valve for steam and fluids, the novelty of which consists in the manner of fitting and fixing the facings against which the slide works.

3. An improved trap for drains, &c., which is merely the ordinary bell-trap reversed.

4. An improved construction of pump for lifting and forcing, in which the use of a branch-pipe and stuffing-box, as ordinarily employed, is dispensed with; the branch in which the handle works being provided with a vulcanized India-rubber tube surrounding the handle at the joint, so as to prevent leakage.

5. An improved mode of constructing pump-barrels, by casting the inferior metal of which they are composed around a brass tube, which acts as a lining to the barrel, and obviates the necessity of burning or boring the interior.

FREDERICK DAM, of Brussels, chemist. *For improvements in preventing incrustation in boilers.* Patent dated August 23, 1852.

The novelty of this invention consists in the employment of hydrate of potash or soda for the purpose of preventing incrustations in steam-boilers, and of removing any deposit that may already have formed. The hydrate is used in the state of solution, a saturated solution being preferred, and is introduced into the boiler, or into the water with which the boiler is supplied, in sufficient quantity to precipitate the impurities contained in the water, the proper proportion for this purpose being previously ascertained by testing some of the water with the solution which is to be used.

Claim.—The application of hydrate of potash or soda for the purpose described.

PROVISIONAL PROTECTIONS.

Dated January 8, 1853.

57. William Henderson. Improvements in manufacturing sulphuric acid and copper from copper ores, reguluses, and matts.

Dated January 28, 1853.

218. Thomas Symes Prideaux. Improvements in the manufacture of iron.

Dated January 31, 1853.

225. Edmund Leach. Improvements in the mode or method of preparing and spinning cotton, wool, flax, and other fibrous substances, and in the machinery or apparatus employed therein.

258. Frederick Lawrence, William Davison, and Alfred Lawrence. Improvements in engines to be worked by steam or other fluid.

Dated February 3, 1853.

290. Thomas Spiller and Anthony Crowhurst. The propelling steam vessels.

Dated February 10, 1853.

351. William Joseph Curtis. An improvement in candlesticks.

355. William Fulton. Improvements in the treatment, cleansing, or finishing of textile fabrics.

357. William Ball. Improvements in machinery for producing looped fabrices.

359. Robert Ash. Improvements in stopping bottles and other vessels.

360. George Hutchison. Improvements in treating oils and other fatty matters.

361. Charles Breese. Improvements in ornamenting papier-maché, japanned iron, china, and other hard or bright surfaces with gold.

363. William Potts. Improvements in sepulchral and other commemorative monuments.

Dated February 11, 1853.

364. Robert Thomas. Improvements in machinery or apparatus applicable to planing, slotting, shaping, grooving, or other similar purposes.

365. Sir James Murray. Improvements in deodorizing cod-liver oil, in rendering it more agreeable and easier to use, either by itself or mixed, and so as to be capable of being administered in larger quantities, and with greater success.

366. Antoine Sanguinède. An improved clasp or buckle.

367. William Choppin. Improvements in locks.

368. Robert Davis Rea. Improvements in bits.

Dated February 12, 1853.

369. Thomas Robert Mellish. Improvements in the construction and mode of closing scent and other bottles.

370. John Fordham Stanford. An improvement in the method of draining dwelling-houses and other buildings, and open and enclosed spaces in cities and towns where sewers and drains are now or may be hereafter constructed.

371. George Winiwarter. Improvements in firearms.

372. Thomas James Perry. A new or improved method of constructing cornice-poles and picture and curtain-rods, and other rods from which articles are suspended.

373. George Parry. Improvements in blast furnaces.

374. George Henry Bursill. Improvements in operating upon auriferous quartz, clays, and other minerals, preparatory to and in order to accomplish the separation of the gold and other metals, also in machinery or apparatus for effecting such improvements.

375. George Lee Lysnar. Improvements in swivel hooks and such like fasteners.

376. William Pidding. Improvements in crushing, drilling, or otherwise treating ores, stone, quartz, or other substances in mining operations, and in the machinery or apparatus connected therewith.

377. William Pidding. Improvements in the treatment of oleaginous, fatty, or gelatinous substances, for purifying, decolorizing, compounding, or clarifying the same.

378. Charles Hadley. Improvements in the means of communication between the passengers, guard, and driver of a railway train, parts of which improvements are applicable to communicating on vessels.

Dated February 14, 1853.

379. William Edward Newton. Improvements in apparatus to be employed for veneering surfaces. A communication.

380. Charles John Burnett. Certain improvements in apparatus or mechanism for driving machinery through the agency of water.

381. Peter Armand Lecomte de Fontainemoreau. Certain improvements in treating fibrous substances. A communication.

382. Peter Armand Lecomte de Fontainemoreau. Improvements in the mode of giving flexibility to beds, sofas, seats, and other similar articles. A communication.

383. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the manufacture of tiles for roofing. A communication.

384. Jean Antoine Gervais. Certain improvements in treating fermentable liquids, and in the machinery or apparatus employed therein.

385. Francis Clark Moustis. An improved mode of raising water.

386. Claude Joseph Lambert. Certain improvements in the preparation of bread and biscuits.

Dated February 15, 1853.

387. William Clark. Improvements in the manufacture of colours and paints. A communication.

388. John Bethell. Improvements in obtaining copper and zinc from their ores. A communication.

390. Benjamin Greening. Improvements in machinery for making fences and other similar articles of wire.

391. Thomas William Kennard. Improvements in apparatus for improving the draught of chimneys.

392. Frederick Chinnock. Improved means of securing axles in their boxes. A communication.

393. George Stiff. Certain improvements in manufacturing paper.

394. Adolphe Nicole. Improvements in rotary engines.

395. Alphonse Rene le Mire de Normandy. Improvements in the manufacture of articles made of gutta percha. Partly a communication.

396. William Blissett Whitton and George Samuel Whitton. Improvements in the manufacture of sewer and other pipes.

397. Joseph and Alfred Ridsdale. Improvements in ships' side lights, scuttles, or ports.

398. Henry Dircks. An improved sewing-machine. A communication.

399. Henry Francis. Improvements in instruments for cutting wool, hair, and other vegetable matters.

Dated February 16, 1853.

400. Henry Stephen Ludlow. An improved process for simultaneously removing dust, stones, or other foreign matter, and for separating the superior and inferior grains in wheat, barley, and malt.

402. Benjamin Cook. Improvements in apparatus for lighting fires.

406. Edouard Sy. Improvements in bookbinding.

408. Charles Sheppard. An improved stove and apparatus for heating air for blast purposes.

410. Alfred Vincent Newton. Improvements in the manufacture of printing surfaces. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 25th*, 1853.)

92. Thomas Lawes. Improvements in the ma-

nufacture of agricultural implements, or an improved agricultural implement.

93. Thomas Lawes. An improved quilt or coverlid

94. Thomas Lawes. Improvements in generating steam.

104. Martyn John Roberts. Improvements in the manufacture of oxides of zinc and tin.

139. William Lewis. Improvements in compounding medicines in the form of pills.

149. Edwin Whele. An improved rotatory engine to be worked by steam, air, or gases.

176. Peter Hyde Astley and John Figgins Stephens. An improved construction for floating vessels, having for its object the rendering them safe means of transit.

217. Michael Angelo Garvey. More effectually dissipating the shock of collision in railway trains, reducing the surfaces exposed to atmospheric resistance, and diminishing oscillation by making portions of the whole of each carriage elastic in every direction, and increasing the power of the carriage to resist severe pressure by means of metallic tubes in its longitudinal angles.

326. Charles William Siemens. Improvements in engines to be worked by steam and other fluids.

(*From the "London Gazette," March 1st, 1853.*)

52. Walter McLellan. Improvements in the manufacture of rivets, and in working in metals.

68. George Ellins. An improved method and apparatus for preparing flax straw for dressing and cleaning.

69. William Moore and William Harris. An improvement in repeating pistols and rifles.

148. Edward William Kemble Turner. Certain improvements in machinery for sweeping or cleaning chimneys, also for more effectually extinguishing them when on fire.

170. Edward Allport. An improvement in the manufacture of buttons by making them with elastic shanks.

180. John Slack. Improvements in the manufacture of textile fabrics.

239. Pierre Frederic Gougy. Improvements in paving streets, roads, and ways.

264. Alfred Vincent Newton. Improvements in apparatus for manufacturing gas and coke.

269. John Tatham and David Cheetham. Improvements in rollers or bosses used for drawing or conveying textile materials and fabrics.

299. Thomas Pascall. Improvements in ridge tiles and roofing.

303. George Tillett. Certain improvements in bedsteads.

359. Léon Godefroy. Improvements in covering or packing rollers for printing fabrics.

379. John Henry Lee. Improvements in sawing.

394. Robert Hawkins Nicholls. Horse hoeing land.

397. Henry Moseley. A machine to be driven by the pressure of a fluid, or to displace a fluid or to measure it.

422. George Rundfield Tovell and John Mann, junior. Improvements in the construction of ships and other vessels.

458. Peter Evans Donaldson. Improvements in dams, locks, and lock gates.

477. Henry Charles Gover. Improvements in the apparatus used in printing with colours.

488. Juliana Martin. An improved apparatus for artificial hatching.

498. Philip Berry. Certain improvements in machinery or apparatus for manufacturing bolts and nuts, and other similar articles in metal.

631. Harrison Blair. Improvements in apparatus for supplying steam boilers with water.

670. Charles Troupeau. An improved diurnal reflector.

876. Jean Hyppolite Sylvan (ainé). Certain improvements in the manufacture of paletôts and other articles of dress, the said improvements being obtained by an improved process of felting and fulling.

995. John Harrison, Robert Harrison, and Alexander Stewart Harrison. Certain improvements in machinery used in the manufacture of textile and other fabrics.

1030. Stephen Green. Improvements in joining earthenware tubes and pipes.

1193. Auguste Edouard Loradoux Bellford. A new mode of advertising. A communication.

102. Frederick Joseph Bramwell. Improvements in steam machinery used for driving piles, hammering, stamping, and crushing.

115. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of blocks for printing music. A communication.

159. Reuben Plant. Improvements in the construction of glass-house furnaces.

209. Casimir Noël. A new regulating bit.

218. Thomas Symes Prideaux. Improvements in the manufacture of iron.

302. William Brown. An improvement or improvements in the construction of metallic bedsteads.

305. Philip Webley. Improvements in repeating pistols and other fire-arms.

320. John Whitehouse the elder, and John Whitehouse the younger. Certain improvements in the manufacture of knobs for doors and other like uses, part of which improvements is applicable to the manufacture of certain articles of earthenware.

327. Edward Palmer. Improvements in carriages used on railways.

338. Thomas Allan. Improvements in protecting telegraph wires.

339. Thomas Allan. Improvements in galvanic batteries.

341. Henry Pooley. Improvements in weighing-machines. Partly a communication.

348. Charles Iles. Improvements in pointing wire.

349. John Webster. Improvements in treating animal matters and in manufacturing manure.

352. Charles Cuylits. Improvements in apparatus for regulating or governing the speed of steam or other engines. A communication.

357. William Ball. Improvements in machinery for producing looped fabrics.

359. Robert Ash. Improvements in stopping bottles and other vessels.

360. George Hutchison. Improvements in treating oils and other fatty matters.

361. Charles Breese. Improvements in ornamenting papier-mâché, japanned iron, china, and other hard or bright surfaces with gold.

365. Sir James Murray. Improvements in deodorizing cod-liver oil, in rendering it more agreeable and easier to use either by itself or mixed, and so as to be capable of being administered in larger quantities and with greater success.

368. Robert Davis Rea. Improvements in bits.

369. Thomas Robert Mellish. Improvements in the construction and mode of closing scent and other bottles.

371. George Winiwarter. Improvements in fire-arms.

374. George Henry Bursill. Improvements in operating upon auriferous quartz, clays, and other minerals, preparatory to, and in order to accomplish the separation of the gold and other metals, also in machinery or apparatus for effecting such improvements.

375. George Lee Lysnar. Improvements in swivel-hooks and such like fasteners.

379. William Edward Newton. Improvements in apparatus to be employed for veneering surfaces A communication.

380. Charles John Burnett. Certain improvements in apparatus or mechanism for driving machinery through the agency of water.

387. William Clark. Improvements in the manufacture of colours and paints. A communication.
389. Valentine Cocker and Reuben Herbert. Certain improvements in and applicable to looms for weaving. A communication.
394. Adolphe Nicole. Improvements in rotary engines.
395. Alphonse Rene le Mire de Normandy. Improvements in the manufacture of articles made of gutta percha. Partly a communication.
396. William Blissett Whitton and George Samuel Whitton. Improvements in the manufacture of sewer and other pipes.
397. Joseph and Alfred Ridsdale. Improvements in ships' side-lights, scuttles, or ports.
406. Edouard Sy. Improvements in book-binding.
408. Charles Sheppard. An improved stove and apparatus for heating air for blast purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

429. Nathan Dutton. Improvements in the manufacture and application of dowels and machinery connected therewith, parts of which machinery are applicable to other purposes. Feb. 18.

WEEKLY LIST OF PATENTS..

Sealed Feb. 26, 1853.

74. Christopher Kingsford.
87. Robert Robertson Menzies.
172. John Jobson.
179. Frederic Newton.
672. Stephen Carey.
941. Thomas Collins Banfield.
1192. Archibald Douglas Brown.
12. Edmé Augustin Chameroy.

Sealed March 2, 1853.

8. Richard Wright.
135. Robert Griffiths.
210. Henry Webb and Joseph Froysell.
447. George Gadd.
954. Samuel Neville.
1053. Isham Baggs.
1086. George Michiels.
1119. Jean Baptiste Moinier and Charles Constant Boutigny.
1121. George Beadon.
1147. George Gwynne and George Fergusson Wilson.
1160. George Michiels.
1180. William Busfield.
1206. Robert Taylerson.
5. Joseph John William Watson and William Prosser.
11. John Bleackley, junior.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

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Mechanics' Magazine.

No. 1544.] SATURDAY, MARCH 12, 1858. [Price 3d. Stamped 4d.

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STENSON AND Co.'s PATENT WELDING HAMMER.

STENSON AND CO.'S PATENT WELDING HAMMER.

Compact soundness and homogeneity in wrought iron, are desiderata which practical men connected with engineering and smith-work in general, have long sought after. Bar-iron being subjected, during forging, to every variety of torsion, punching, and other tests, in the multiform uses to which it is made subservient, any defect occurring by cleavage, or splitting while in the hands of the workman, is a direct loss both in time and material. Every improvement, therefore, in the welding, and greater uniformity in the character of the iron, cannot fail of being highly appreciated.

When bars made from "piled" iron, imperfectly welded, are used as piston or other rods, working through stuffing-boxes, longitudinal seams, or lines of cleavage are frequently apparent throughout their length. The edges of these dark lines are usually rough and serrated, and are the too frequent cause of premature destruction to the hempen packings through which they work.

Defects in the welding of piled iron are also frequently manifest in the cleavage and lamination of the tyres on carriage wheels. It is no uncommon thing to see the tyre of a coach-wheel, after having only been a short time at work, and when but one-fourth or one-sixth worn, split and divide like the leaves of a book—a defect which at once renders its replacement indispensable. A compact iron was formerly produced in the "Catalan forge," or "Bloomery fire;" the fuel used being charcoal, which was supplied from the extensive woods then abounding in many parts of England.

By means of this primitive process, iron was made directly from the ore, and brought out of the fire in a solid mass, which, by being repeatedly heated and hammered, was ultimately reduced to the size and form required. But as those ancient woods became exhausted, the iron manufacture gradually retired from its former localities, and took its position chiefly in those districts where the coal-fields offered a cheap and abundant supply of fuel. The iron made by coke, however, though produced at a cost greatly below that of the charcoal forges, was found to be of a quality so inferior to that of the latter as to render improvement not only desirable, but indispensable to a successful competition and an abundant production.

The conversion of pig into malleable iron, by the process of "puddling," as invented by Cort, was an important step towards the desired end; but the iron thus made was found to be of a weak nature, known by the term "cold-short," more especially when the pig had been produced from ores containing an excess of silicon, phosphorus, sulphuret of iron, or other foreign matters.

With a view to the production of a more fibrous character in the iron, came next the "doubling and welding," or "rolling" the puddled balls, after they had been hammered, into "rough bars" or "puddled bars"—a method now so generally adopted in our iron works. These puddled bars, being cut to the required lengths, are placed one upon another, and formed into "piles," which may be composed of from two or three to eight or ten plates. The furnace is now charged with as many of these piles as may be convenient, and when they are at a high welding heat the drawing and rolling of the charge commences.

The object effected by means of the patent process is a more perfect welding of the pile into a solid mass than has hitherto been accomplished; thus preventing cleavage or lamination either in forging or in wear.

The usual method is to take the pile out of the furnace and draw it to a considerable distance along the floor to the rolls. During this time, the air acting upon and between the plates composing the pile, produces an oxidation and a cooling of the iron, which renders the welding imperfect. By the patent process the welding is effected at the instant the pile leaves the furnace, after which it is passed through the rolls in the usual manner.

The engraving represents Stenson and Co.'s Patent Welding Hammer, as used at the Patent Iron Scrap Forge-works, Northampton.

A A is the reverberatory furnace, in which the iron is heated previous to being rolled into finished bars. B the furnace-door, which is lifted by a lever. C the patent hammer, resting upon a catch, d. E a lifting-rod, which is in constant motion, and provided with a catch for lifting the hammer by means of the stud at F. G a stay which carries the friction roller, I; this roller is the fulcrum on which the edge of the lifting-rod, E, vibrates. The lifting-rod is pressed up to the roller by means of the spring, J. H, a vertical stay from the top of the furnace to a beam overhead, which carries the driving-pulley, levers, &c. K, a cast-iron block, about 12 inches square and 2 feet high, supporting an anvil, the face of which is level with the heating-floor of the furnace. L, a vertical

lever, the lower end working in a joint, and the upper end made to vibrate when pushed back by the sliding bolt, O, and brought back to its place by the spring. M, a slide working between two guards, m m, and lifted by means of the lever, N. When the door, B, is raised, and a pile of iron brought out of the furnace upon the anvil, the slide, M, is lifted, and is then pushed back by the bolt, O, by which the catch, d, is also thrown back, and the hammer immediately falls upon the pile as it is drawn from the mouth of the furnace, and strikes one, two, or more blows, as may be required, until the slide, M, is allowed to fall below the action of the bolt, O, when the hammer, C, again rests upon the catch, d, until the next pile is drawn.

Hammers of various weights are used, according to the size of the iron in course of manufacture; a head of 50 pounds being found sufficient for small piles, while one of 200 or 300 pounds is necessary when making larger iron. In the works of the patentees, who manufacture from scrap-iron—which, from its more fibrous character and greater toughness, requires more hammering than that of the ordinary quality as puddled from pig-iron—this larger weight is always employed. The hammer-heads used in the patent welding machinery are all fitted to the same helve, and are changed in a few minutes when required. The effect is produced by simple means, and the machinery is propelled by the steam-engine which drives the rolling-mill. The hammer, when at work, has a fall or compass of about 2 feet 6 inches, which is found to be sufficient.

Not only is a sound weld secured, but a considerable saving is effected in the manufacture by the use of this hammer; as the pile, being struck while at its greatest heat, is rendered into a solid mass, which prevents the over-drawing during the process of rolling into bars, and thus saves the greater part of the waste usual in cropping the rough ends at the shears.

THE LUCIFER-MATCH MANUFACTURE.

[The following important communication from Mr. Charles Tomlinson, the Editor of the *Cyclopædia of Useful Arts*, relative to the present transition state of the Lucifer-Match Manufacture, will be read with extreme interest by every one who is at all acquainted with the deplorable evils which up to this time have been incidental to it. In the last Number of the above-mentioned work, Mr. Tomlinson has been at great pains to give an ample exposition of the whole subject; and the admirable article which he has written upon it ought certainly to be read in connection with the following letter:]—

To the Editor of the Mechanics' Magazine.

Sir,—I have just received from a lucifer-match manufactory a box of lucifer matches, in the production of which the red, or amorphous-phosphorus is used instead of common phosphorus.

The importance of this communication will appear from the following facts:

It has been estimated that the English and French manufacturers of phosphorus are now producing at the rate of 300,000 lbs. of phosphorus per annum, nearly the whole of which is consumed in making lucifer matches.

In compounding the emulsion for tipping the matches, the German manufacturers make 3lbs. of phosphorus suffice for five or six million matches. If we suppose only one-half of the French and English annual product of phosphorus to be employed in making matches, this will give us 250,000 millions of matches as the annual product.

We need not suppose this to be an exaggerated statement, when we consider the daily product of some of our match manufactories. I have lately had occasion to describe the processes of a London factory which produces upwards of 2½ million matches daily. For this purpose fourteen 3-inch planks are cut up: each plank produces 30 blocks; each block of the dimensions 11 inches long, 4½ wide, and 3 inches thick, produces 100 slices; each slice 31 splints, each splint 2 matches. Thus we have $14 \times 30 \times 100 \times 31 \times 2 = 2,604,000$ matches, the day's work of a single factory in London. At Messrs. Dixon's factory, near Manchester, from six to nine millions of matches are produced daily.

There are at least four very considerable makers of lucifer matches in London and its vicinity, and a large number of small makers. There are also manufactories of varying degrees of importance in many of the large towns of this kingdom; the largest being that of Manchester, above named.

On the continent of Europe manufactories of matches have spread in a remarkable manner from Transylvania on the borders of Turkey, and near the Black Sea, to the inland lakes of Sweden, and the

Finland shore of the Gulf of Bothnia. In the United States of America, and in central America these factories are also to be found. The trade is most flourishing in Germany; and in order to encourage it, some of the governments sell the timber of their forests at an almost nominal price. The German export trade is rapidly increasing. The manufacturers have their agents stationed wherever there is a large demand for matches. Large quantities are imported into this country; and being well packed in cheap but substantial cases, they are carried by the railway companies as *Toys*, while the produce of our own manufactories is frequently refused to be conveyed.

In the manufacture of lucifer matches the splints are first tipped with sulphur, and then with a composition formed of phosphorus, chlorate of potash, and colouring matter mixed up with glue. This composition is spread out upon a stone slab, heated by steam, and the matches, mounted in frames, to keep them separate from each other, have their ends dipped into this composition. The matches are then dried in a hot room, and afterwards packed in boxes for sale.

All the persons engaged in the factory are thus more or less exposed to the fumes of phosphorus. The effect of this exposure is to induce a disease which, to quote the description of a medical man "is of so insidious a nature, that it is at first supposed to be common toothach, and a most serious disease of the jaw is produced before the patient is fully aware of his condition. The disease gradually creeps on until the sufferer becomes a miserable and loathsome object, spending the best period of his life in the wards of a public hospital. Many patients have died of the disease; many, unable to open their jaws, have lingered with carious and necrosed bones; others have suffered dreadful mutilations from surgical operations, considering themselves happy to escape with the loss of the greater portion of the lower jaw."* I will not shock your readers with any further surgical details. I will merely remark, that at the present time, and in one factory, a young man and a young woman have resumed their work, each with the loss of the lower jaw; and I am assured that cases of such mutilation are by no means uncommon, as our hospitals and infirmaries can testify.

Now, what is the remedy for this fearful state of things? Improved ventilation of the factories, habits of cleanliness and temperance on the part of the operatives may mitigate the evil; but when it is stated that the clothes of the persons engaged in the dipping-room, and the hands of the children engaged in boxing the matches, present a luminous glow in a dark room, it is evident that plans for improved ventilation, &c., will not insure impunity to persons thus exposed to the fumes of phosphorus acid during sixty or seventy hours per week. A number of small makers occupying garrets and kitchens are, it is to be feared, constantly exposed to these noxious fumes. Nor is the jaw disease necessarily confined to the poor operatives. Instances are known of children having taken it simply by playing with the matches: others have been killed by sucking them—but in this case orpiment (one of the sulphurets of arsenic) had probably been used as an ingredient in the composition, instead of sulphuret of antimony. But with ordinary matches, when we consider that there is perhaps not a house in the kingdom, scarcely a room, that is not supplied with its box of lucifer matches, each box presenting from 50 to 100 points of phosphorus, scarcely protected by its thin coating of indurated glue from the oxidising influence of the air, the public is also exposed to fumes which, though slight, are constantly present, and must be more or less injurious to health.

The lucifer match is a simple, beautiful, and efficient contrivance, the result of a long series of improvements on the old sulphur match of the tinder-box; and it owes its present degree of efficiency for the most part to phosphorus. But the chemistry which contrived the lucifer match can surely do something to arrest the progress of the frightful disease consequent on its manufacture. A few years ago M. Schrötter announced the discovery of amorphous phosphorus; a substance as unlike the common crystalline phosphorus as the sparkling diamond is unlike a lump of black charcoal. The amorphous phosphorus is not soluble in sulphuret of carbon as common phosphorus is; does not ignite under ordinary friction or in contact with iodine, as is the case with the common variety; is not poisonous, exhales no injurious acid fumes on exposure to the air; it is, in fact, as distinguished for negative qualities as the ordinary kind is for positive qualities, and yet when mixed with certain substances and exposed to friction it explodes with violence.

This then would appear to be the substance eminently calculated to replace common phosphorus in this manufacture; and when the amorphous phosphorus was first introduced there was a general expression of admiration at the marvellous powers of chemistry which could thus deprive a substance of its active noxious properties, and yet leave that substance the same ele-

* Mr. Harrison, in the *Dublin Quarterly Journal of Medical Science* for August, 1852.

mentary body as before, with the same atomic weight, and the same combining powers.

In July, 1851, a process was patented, and arrangements were made for manufacturing the amorphous phosphorus on a large scale. Specimens of the new article were sent to the large lucifer-match manufacturers of this country and of the Continent; yet up to the present time no manufacturer has adopted it. In writing on this subject in a recent Number of my *Cyclopædia of Useful Arts*, I thought myself justified in condemning the supineness of the manufacturers, and their apparent indifference to the sufferings of their operatives. On submitting my censures to Messrs. Dixon, of Newton Heath, near Manchester,—who are probably the largest manufacturers of lucifer matches in the world—they assured me of their anxiety to adopt every available means that might be conducive to the health and comfort of their work-people, and that if they had not yet made use of the amorphous phosphorus it was simply because they had not been able to make it succeed; and in a letter dated 7th February last, they say: "Whatever future results may be produced from further experiments we cannot say, but trust to chemical science to remove the dreadful disease arising from the use of the present phosphorus."

The difficulty in the use of the amorphous phosphorus has been to combine it with other ingredients so as to produce a paste capable of igniting quietly with moderate friction, and not with those explosive bursts of flame which mark the free use of chlorate of potash. I am happy to be able to state that the Messrs. Dixon, not deterred by former failures, and even danger from explosions, have since the date of the letter alluded to, succeeded in producing matches which do fulfil the above conditions to so great an extent as to warrant the hope that in the course of the present year the public will be supplied with matches made with the amorphous phosphorus.

The specimens now before me contain a little too much chlorate of potash; with moderate friction they burst out into a white flame, which however kindles the wood well: although not perfect, they have the following decided advantages over the common matches:—they produce no light in the dark under 400°; they have no smell, are not liable to contract damp, and may be placed on a hot mantle shelf without taking fire; they are thus adapted to moist and hot climates, and will keep for any length of time without change.

I must apologise for the length of this letter. If the public will take an interest in the manufacture of amorphous matches, the time is not very distant when that form only will be tolerated, and thus the interests of humanity will be served by the extermination of a cruel disease, and the introduction of a safer and better article of domestic use.

CHARLES TOMLINSON.

Bedford-place, Ampthill-square,
March 8, 1853.

THE TRADES OF BIRMINGHAM.

THE glass trade is exceedingly brisk. A great number of excellent glass-blowers and cutters emigrated for America during the depression, and a society was established for enabling all who could not support themselves and families here to leave the country. Many availed themselves of the fund, and were well received in the United States; and many more would have followed if a favourable change in their condition had not taken place.

It is understood that contracts have been entered into for the make of the last Government new musket, which is just out, and which, as a matter of course, is stated to be superior to all that have gone before it. One Birmingham gunmaker of great eminence is intrusted with the getting up of 2,000 of the new guns. The operatives in the execution of the contracts for the Minié rifles deny that the fault in the sight complained of in the House of Commons on Monday night week is attributable to them; and they are fearful that, unless it be satisfactorily explained, it may operate injuriously against them when competitors for future contracts. The men held a meeting respecting it on Thursday night, and have determined to have the matter thoroughly investigated. They admit that the sight upon the new Minié is misplaced, and consequently incorrect, but say that this is entirely owing to a deviation from the original design and the adoption of a favourite crotchet of the chief inspector. For the honour of the gun trade, now identified with the name of Birmingham, they are most anxious that a searching inquiry shall take place.

THE IRON TRADE.

THE iron trade is still prosperous, the furnaces are at full work, orders are coming in, and prices are consequently firm. The demand for foreign rails is very great, and some new contracts are under consideration of the large houses. The pig-trade is still flat, and some have changed hands at *5l.* per ton, where parties have been in immediate want of cash; but the general quotation for hot blast mines is *5l.* 10s. The demand for

plates, bars, and rails is greater than can be supplied.

Merthyr.—The struggle to obtain a reduction of prices that commenced immediately after the last preliminary meeting of the trade, is still continued; but it is generally thought with declining chances of success. Previously to that meeting 10*l*. 10*s*. per ton for merchant iron had in a few instances been realised, and it was thought that 12*l*. might have been obtained; but after due deliberation 11*l*. per ton was decided upon as the limit to which the then dominant tendency to advance should be restricted. This settlement did not appear to give universal satisfaction. For those who had little or no stock in hand it was too high, while for others, who were desirous of availing themselves of their customers' credulity it was too low; and a feeling of sulkiness having been created in some quarters, it was taken advantage of to induce a struggle for a general reduction of prices. This, however, has been resisted with great firmness. Two months of the quarter have passed without any appearance of giving way, and the resistance has received a fresh stimulus within the last few days.—*Cambrian.*

WARREN'S ILLUSTRATIVE COTTON MACHINERY.

The comprehensive series of popular lectures on the cotton manufacture, recently delivered by Mr. Warren, at the Society of Arts, and a notice of which has appeared in the *Mechanics' Magazine*, were admirably illustrated by an extensive collection of model machines on a large scale, designed to show the salient points of the course of invention in this great branch of our national industry. These machines have been constructed by Mr. Warren himself; and there is no part of the cotton manufacture, from the first treatment of the raw material to the final production of the cloth, whether plain, dyed, or printed, which has escaped his attention. A long experience in every branch of factory-work, and a perfect acquaintance with the arts of the engineer and of the machinist have contributed to fit him perfectly for this great work of illustration. Added to which, a devoted application to the study of the subject, pursued most creditably in conjunction with the arduous duties of his avocation, has rendered his epitome of it eminently instructive and valuable.

Mr. Warren's collection consists in the first place of twelve model machines, working with a precision equal to that of any employed in a regular cotton-factory and print-works. He has also a large map of India, a magnified drawing of the cotton-plant, a drawing of the early methods of manufacture, a case of specimens of the varieties of cotton grown in British India and elsewhere, together with seeds, pods, cotton-oil, and oil-cake; a specimen of Hindoo calico-printing, a Hindoo dress and turban, a quantity of chemicals and dye stuffs; print-blocks of the earliest and latest construction; dye-vats, bleaching-troughs, engraving tools, and steaming apparatus. The mechanical portion of his collection contains examples of the most recent patented improvements which have been introduced. Amongst them is a fine model of Whitney's "Saw-gin." All the important points in the early history of their manufactory, embraced within the period from 1783 to 1790, have received particular attention in this illustrative series. The inventions and constructive principles of Kay, Wyat, Paul, Butler, Kay, jun., Highs, Hargreaves, Lees, Wood, Crompton, Cartwright, and Watt, are indicated in chronological order, and the peculiarities of each explained and illustrated. Blowing-frames, carding-engines, the formation of continuous slivers in the drawing-machines, the construction and operation of the roving-frames, the uniform twisting of the threads upon the bobbins, the manner in which the speed of these instruments is regulated, and that in which they are thrown out of gear when enough work has been done by them,—all these, and numerous other subordinate operations, have received ample illustration in Mr. Warren's machines, which also include those comprehended under the generic term "loom."

Mr. Warren's lectures on the cotton manufacture have justly excited considerable interest from this combination of circumstances, and much credit is certainly due to him for the observation, study, and industry which he has exerted in preparing so comprehensive and popular a course of illustrative lectures.

On Friday, his Royal Highness Prince Albert visited the Society of Arts, and inspected the entire collection, examining with great attention its numerous details. The Prince spent upwards of an hour and a half in this way, and expressed himself extremely pleased. We may add to what we have already said concerning Mr. Warren, that he is well and favourably known in the north for his zealous and successful efforts to promote education among the labouring-classes, and that he himself is a self-educated man.

THE DESIGNS EXTENSION BILL.

The Designs Extension Bill passed the House of Commons on Tuesday night.

LONDON FIRES IN 1852. — PART II.

TWENTY-SECOND ANNUAL REPORT. BY MR. WILLIAM BADDELEY, C.E.

The following is an analysis, in a tabular form, of the fires which occurred in London last year, exhibiting in each instance the occupancy of the part of the premises in which the fire originated, and the comparative liability to accident by fire of various trades, manufactories, and private dwellings:

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Apothecaries, and dealers in drugs (no laboratories)	1	0	5	6
Bakers	1	5	7	13
———, biscuit	0	0	1	1
———, muffin	0	0	1	1
———, pie	0	1	2	3
Barge and boat-builders	0	0	1	1
Basket-makers	0	1	0	1
Beer-shops	0	1	4	5
Blacking-makers	0	0	1	1
Bleachers	0	1	0	1
Booksellers, bookbinders, and stationers	2	8	8	18
Bottle-merchants	0	0	1	1
Brewers	0	1	0	1
Brokers and dealers in old clothes	0	1	8	9
Builders	1	5	3	9
Cabinet-makers	1	7	7	15
Cane-dyers	0	1	0	1
Carpenters and workers in wood, not cabinet-makers	1	22	33	56
Caoutchouc-manufacturer	0	0	1	1
Cement-works	0	1	0	1
Chandlers	0	7	8	15
Charcoal and coke, dealers in	0	1	1	2
Cheesemongers	0	4	3	7
Chemists (including laboratories)	0	0	2	2
Churches	0	0	2	2
Chicory and coffee-roasters	0	0	2	2
Coach-makers	0	0	1	1
Coffee-shops and chop-houses	1	5	12	18
Colour-makers	0	1	0	1
Confectioners and pastrycooks	0	2	1	3
Coopers	1	0	1	2
Corkcutters	0	0	1	1
Cornchandlers	0	2	0	2
Cotton wool, dealers in	0	1	0	1
Curriers and leatherdressers	0	1	1	2
Distillers, illicit	0	0	1	1
———, tar	1	1	0	2
———, turpentine	0	1	0	1
Drapers, woollen, linen, and mercers	0	15	23	38
Druggists, wholesale	0	1	4	5
Drysalters	0	1	0	1
Eating-houses	0	3	11	14
Engineers, mechanical	1	1	1	3
Farming stock	1	5	2	8
Fire-annihilator maker	1	0	0	1
Firework-makers	0	2	0	2

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Founders	0	0	4	4
Furriers and skin-dyers	0	0	1	1
Gas-works	0	2	2	4
Glue-makers	0	1	0	1
Grocers	0	2	5	7
Hat-makers	0	1	0	1
Hemp-dressers	0	1	3	4
Horsehair-merchants	0	0	2	2
Hotels and club-houses	0	0	2	2
Japanners	0	2	1	3
Lamp-black makers	0	1	1	2
Laundresses	0	0	3	3
Lucifer-match makers	0	2	3	5
Manchester warehouses	0	3	3	6
Marine stores, dealers in	0	2	5	7
Mats, dealers in	0	0	1	1
Milliners and dressmakers	0	2	7	9
Musical-instrument makers	0	0	2	2
Oil-mills	1	0	0	1
Oil and colourmen (not makers)	0	4	9	13
Painted baize-makers	0	2	0	2
Painters, plumbers, and glaziers	0	2	1	3
Paper-makers	1	1	0	2
——— stainers	1	1	1	3
Pasteboard-makers	0	1	0	1
Pawnbrokers	0	0	1	1
Pipe-makers	0	0	1	1
Printers, letter-press	0	3	2	5
———, copper-plate	0	1	0	1
Private dwellings	1	33	303	337
Public buildings	0	0	1	1
Rag-merchants	0	0	4	4
Railways	0	0	3	3
Rope-makers	1	2	0	3
Sale-shops and offices	1	11	25	37
Saw-mills, steam	1	3	3	7
School of industry	0	0	1	1
Scum-boilers	0	0	1	1
Ships	0	0	5	5
——, steam	0	1	0	1
Ship-builders	0	2	0	2
—— chandlers	1	0	0	1
Silk-dresser	0	0	1	1
Soot-merchant	0	0	1	1
Stables	0	3	13	16
Straw-bonnet makers	0	2	0	2
Sugar-refiners	0	1	1	2
Tailors	0	5	9	14
Tallow-chandlers, melters, wax-chandlers, and soap-boilers	0	1	3	4
Tanners	0	0	1	1
Tarpaulin-makers	0	1	1	2
Tinmen, braziers, and smiths	0	3	4	7
Tobacconists	0	2	5	7
Toy-warehouses	0	0	3	3
Under repair and building	2	4	7	13
Unoccupied	0	1	5	6
Upholsterers	0	1	0	1

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Varnish-makers	0	1	2	3
Victuallers	2	13	25	40
Warehouses	0	3	3	6
Weavers	0	1	1	2
——, mat	0	0	3	3
Wharfingers	0	0	1	1
Wine and spirit-merchants	0	0	4	4
Wood-merchants	0	1	1	2
Total	25	238	660	923

The daily distribution of last year's fires was as follows:

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
144	137	133	127	129	117	136

Their distribution through the hours of day and night has been in the following proportion:

	First hour.	Second hour.	Third hour.	Fourth hour.	Fifth hour.	Sixth hour.	Seventh hour.	Eighth hour.	Ninth hour.	Tenth hour.	Eleventh hour.	Twelfth hour.
A.M.	61	59	40	33	19	20	17	14	23	25	20	26
P.M.	32	18	28	27	25	50	51	57	80	82	67	49

The causes of fire, so far as could be satisfactorily ascertained, may be stated as follows:

Accidents, unforeseen, and for the most part unavoidable	15
Apparel, ignited on the person	9
Bleaching hops	1
——— nuts	1
Candles, various accidents with	131
———, ignited bed-curtains	73
———, ——— window-curtains	49
Carelessness, palpable instances of	17
Charcoal fires	1
Chicory-roasting	1
Children playing with candles	1
Children playing with fire	6
——— gunpowder	1
——— lucifers	4
Cinders put away unextinguished	19
Coppers overheated	2
Fire-sparks	69
—— kindled on hearths and other improper places	7
Fire-arms, discharging	2
Fireworks, making	4
———, letting off	6
Friction	1

Flues, foul and ignited	34
———, defective or overheated	37
———, blocked up	10
———, of hot plate	3
Fumigation, incautious	2
Furnaces	16
Gas, escape of, from defective fittings	56
——, ——— street-mains	2
——, lighting of	6
——, burning too high	9
——, explosion at works	2
Hearths, defective	2
Intoxication	9
Lamps, oil	2
———, naphtha	3
Lime, slaking of	7
Linen, drying or airing before fire	39
Lucifer-matches, making	3
———, accidentally ignited	8
———, accidentally ignited by cat	1
———, accidentally ignited by sun's heat	2
———, using	13
Naphtha, explosion of	1
———, bottle of broken	1
Ovens, defective and overheated	7
Pitch and tar, boiling of	4
Shavings, loose, ignited	49

Spontaneous ignition of dung	1
——— lamp-black	3
——— phosphorus	2
——— rags, wet	4
———, greasy	1
——— tan	1
Smoking in bed	1
Stills, illicit	1
Spirits, drawing off	1
Steam-boilers, heat from	3
———, explosion of	1
Stoves, improperly set, defective, and overheated	17
——, drying	10
——, ironing	2
——, muffin	1
——, pipe	9
——, portable	2
——, gas	2
Suspicious	9
Tobacco, unextinguished	25
Varnish and oils, &c., boiling of	7
Wilful	15
	865
Unknown	58
Total	923

[We find ourselves reluctantly obliged to defer the remaining portion of Mr. Baddeley's Paper for our next Number.]

INSTITUTION OF CIVIL ENGINEERS.

The ordinary weekly meeting of the Institution was held on Tuesday evening last, James Meadows Rendel, Esq., President, in the chair. The Paper read was, "Experimental Investigation of the Principles of Locomotive Boilers," by Mr. D. K. Clark.

The Paper commenced with some historical facts in locomotive progress; showing that the general design of the locomotive was matured immediately after the trials on the Liverpool and Manchester Railway, in 1829; combining the multitubular horizontal boiler, the horizontal cylinders, and the blast-pipe. Reference was made to the various systems practised in working out the general design, and to the necessity for fixed principles in proportioning the locomotive to the work for which it was destined. For the proper discussion of the question, it was indispensable to distinguish the three elements of the machine,—the boiler, the engine, and the carriage,—and to consider them separately, with respect to their proper functions, as the mixing up of one with the other had caused much of the confusion with which many of the recent discussions on the subject had been invested.

The Paper was chiefly devoted to the discussion of the physiological principles of locomotive boilers. It was argued that the combustion of coke in the firebox was, in practice, very completely effected; that it was quite independent of the strength of the draft, being equally complete with fast and slow drafts; that expedients for improving the combustion were superfluous; and that the combustion of coal might also, in practice, be perfected by a judicious use of the ash-pan, damper, and the fire-door. The evaporation of 12 lbs. of water, per pound of pure coke, was found, by careful laboratory experiments, to be the maximum evaporative performance. In the best ordinary practice, an actual evaporation of 9 lbs. of water per pound of coke, or 75 per cent. of the possible maximum, was readily obtained, the balance being lost by leakage of air and by waste; and it was adopted by the author as the ordinary standard of practical economical evaporation.

It was shown, by numerous examples, that the question of the relative value of fire-box and tube surface was of no practical importance, as the efficiency of boilers was not sensibly affected by their relative amounts; that the superiority of fire-box

surface was due merely to its greater proximity to the fire; and that the distinction of radiant and communicated heat was merely circumstantial; that what was gained in radiant heat was lost in communicated heat; and that whether it was all radiating or all communicated mattered not to the total efficiency of the fuel. On these grounds the author regarded with indifference the use of such expedients as extended fire-boxes, mid-feathers, corrugated plates, and combustion-chambers; and it was asserted, that where the addition of mid-feathers had been found advantageous, there had been a deficiency, or mal-arrangement of the tube-surface.

A minute analysis was made of the results of numerous authenticated experiments on the evaporative power of locomotive boilers, of very various proportions, comprising several made by the author, on the engines of the Caledonian, Edinburgh and Glasgow, and Glasgow and South-Western Railways. It was concluded that the economical evaporative power of boilers was materially affected by the area of the firegrate, and by its ratio to the whole heating surface; that an enlargement of the grate had the effect of reducing the economical evaporative power, not necessarily affecting the quality of combustion in any way, but governing the absorbing power of the boiler, as the lower rate of combustion, per foot of grate, due to a larger area, in burning the same total quantity of fuel per hour was accompanied by a reduced intensity of combustion, and by a less rapid transmission of heat to the water, in consequence of which a greater quantity of unabsorbed heat must escape by the chimney. An increase of heating surface, again, reduced the waste of heat, and promoted economy of fuel, and added greatly to the economical evaporative power. In short, the question resolved itself into the mutual adjustment of three elements,—the necessary rate of evaporation, the grate-area, and the heating surface, consistent with the economical generation of steam, at the assumed practical standard rate of 9 lbs. of water per pound of good coke. An investigation of the cases of economical evaporation, in the table of experiments, conducted the author to the following very important equation, expressing the relation of the three elements of boiler-power; in which c was the maximum economical evaporation, in feet of water, per foot of grate per hour; h was the total heating surface, in square feet, measured inside; and g was the grate-area in square feet;

$$c = .00222 \frac{h^2}{g}$$

From this it followed:—1st. That the economical evaporative power decreased directly as the area of grate was increased, even while the heating surface remained the same. 2nd. That it increased directly as the square of the heating surface, when the grate remained the same. 3rd. That the necessary heating surface increased, only, as the square-root of the economical evaporative power. 4th. That the heating surface must be increased as the square-root of the grate-area, for a given economical evaporative power. It was contended thence, that the heating surface would be economically weakened by an extension of the grate, and would be strengthened by its reduction; and that whereas large grates were commonly thought to be an unmixed good, and being generally recommended, were usually adopted; still they might be made too large; not that their extension affected the quality of combustion, but that the economical evaporative power might be reduced. Concentrated and rapid combustion was alike the true practice for the largest and the smallest boilers; and in locomotives, where lightness, compactness, and efficiency, were primary objects, the boilers should be designed for the highest average rates of evaporation per foot of grate, that might be followed, in good practice, consistently with the highest average rate at which coke could be properly consumed; as, in this matter, the smallest grate, and the smallest amount of heating surface, consistent with good practice, might be employed. It was stated that 150 lbs. to 160 lbs. of good sound coke could be consumed per foot of grate per hour; and, allowing for inferior fuel, an average maximum of 112 lbs., per foot of grate, per hour was recommended as a general datum. This determined the average maximum of economical evaporation to be 16 feet of water per foot of grate per hour, allowing 9 lbs. of water per pound of coke; for which 85 feet of heating surface, per foot of grate, should be provided. It was accordingly recommended that a heating surface at least 85 times the grate area should be adopted in practice.

It was also shown, by examples of inferior economy of evaporation, that the clearance between the tubes, for the circulation of water and steam, was, in many boilers, much too small; that the clearance should be in proportion to the number of tubes; and that for good practice, a clearance at the rate of one-eighth of an inch for every thirty tubes should be allowed.

The author supplied several practical rules, deduced from this examination, and stated his conviction that the deductions from his experience, with locomotive-

boilers, were, in the main, applicable to all other forms of boiler. He applied the rules to several conspicuous examples of locomotive boilers of the present day, and endeavoured to show in what respects they were defective; he also suggested simple means of rectifying them, and of improving their action, and alluded to the long boiler of Stephenson as affording the best example of combined lightness, compactness, and evaporative power.

The author finally referred to his practical investigations on the subject of the blastpipe; from these he concluded that, in all practical cases, the blastpipe was susceptible, by a correct adjustment of the details of the boiler, of being made abundantly wide enough, consistently with the demands for steam, to afford a free and sufficient exhaust, at all speeds, so as practically to remove all back pressure by imperfect exhaustion.

The discussion of Mr. Clark's Paper on "Locomotive Boilers" was adjourned until the meeting of Tuesday, March 15th, when it was announced that the whole of the evening would be devoted to the subject.

After the meeting, Mr. Hulford, of H.M. Dockyard, Woolwich, exhibited an ingenious instrument of his invention, for ascertaining from an indicator-card the steam-pressure on the piston of a steam-engine.

The indicator-card being placed on the board, so that the atmospheric line coincided with the marks on the retaining springs, the triangular scale was placed at the bottom of the figure, and the side roller made to revolve, until the spiral line on it intersected the edge of the scale, in which position the roller was fixed. The distances between the steam and vacuum lines were taken by sliding the scale along the figure, and ten or twenty divisions might be taken according to the degree of accuracy required; the sum of the distances, divided by their number, gave the mean pressure on the piston.

A great saving of time in the measurement of all irregular figures evidently resulted from the use of the instrument, and its simplicity and low price were also points in its favour.

The Cruise of the "Challenger" Life-boat, and Voyage from Liverpool to London in 1852. William Pickering.

The astounding results which have been obtained with that novel combination of materials generally known as the "tubular life-boat," will be certain to ensure for this little volume a very large measure of attention. It is well known that when the *Challenger*,—for such is the suggestive name which her inventor has bestowed upon her,—arrived in the Thames, she had just accomplished a coasting voyage from Liverpool, passing through the Menai Straits, and calling at Barmouth, Cardigan, Strumble Head, Swansea, Ilfracombe, Penzance, Plymouth, Cowes, Brighton, Ramsgate, and other intermediate places. In the course of this long and arduous navigation the *Challenger* was frequently in situations of extreme danger, many of which were purposely sought by her crew for the purpose of proving her efficiency under circumstances where life-boats, even upon the principle of construction which the Northumberland Committee have sanctioned, would infallibly have gone to pieces, or drowned their occupants in "righting."

To give anything like an idea of the perfect adaptation of this singular structure to the numerous requirements which a life-boat ought to meet, would be wholly impossible in the space we have at our disposal. We can only make a few general observations. The log of the voyage has been written with great fairness; and though a very pardonable admiration of the qualities of "the craft" may be traced in the description of the numerous incidents which figure in its pages, facts are stated circumstantially, and the means of corroborating or disproving them are placed within reach. We may, however, instance the entrance to Barmouth, the run from Ilfracombe to Padstow, and the passage of the bar at Rye, as feats of extreme danger and difficulty, which have been accomplished by means of this ingenious vessel.

As the subject now stands, we must take it that the *Challenger* is capable, under all circumstances, of accomplishing the several matters included in the challenge of her owner and inventor, Mr. Richardson, circulated on the 23rd of February, 1852. The principal of these are towing out by steamers against head wind and sea, for three or four miles; towing before the wind for one or two miles, the hawser paid off to at least forty fathoms; beaching through the surf on a lee-shore; landing, re-embarking, and rowing out to the steamers against the surf; anchoring in broken water with spring on cable, so as to keep nearly broad-side to the surf, the crews all the while being on the windward gunwales; and working to windward. The voyage of the *Challenger* shows clearly enough that she is capable of encountering

difficulties from which ordinary boats must shrink.

Her tubes draw only a few inches of water, and the heaviest sea that can strike her, or the greatest inequality of weight that can be tried, merely has the effect of raising the tubes alternately without submerging the boat. Nor even is it possible that the men can be washed out of her; for a sea immediately disappears through the grating. Thus the great object for which this novel boat has contended—that of demonstrating the impropriety of attaching paramount importance to the "self-righting" principle—appears to be more than accomplished, even if that principle did not stand self-condemned by the melancholy accidents at Rhyl, and atLytham.

There are many other features of this subject which it would be important to notice in connection with the voyage of the *Challenger*, but for many reasons it is wholly unnecessary to pursue it further. The challenge of Mr. Richardson has not been accepted; but we do not pretend to assign a reason for neglecting or evading it, still less to found anything upon the circumstance. It is essential, however, considering the very unsatisfactory state of our life-boat arrangements, that the merits of this invention should at once be subjected to the test of ordinary practice. The account of its efficiency in the little book before us, making every allowance for partiality, assigns an extremely high character to it, while the reports of the state of many of the stations and their life-boats, which are occasionally introduced, are of a nature to demonstrate the necessity of bringing the whole subject within the sphere of Parliamentary cognizance. This, we are satisfied, must soon be the case. In the meantime, the tubular life-boat principle cannot remain in concealment, but must, whether assisted or not assisted, approve or destroy itself in nautical estimation.

The reader of this book will very much instruct himself in the management, exigencies, and relative advantages of life-boats; and beyond that, it is proper to add, that it possesses very great literary merit, which will please him in its numerous and graphically described incidents.

The Steam Navy, and the application of Screw-propellers to Sea-going Line of Battle Ships.—A Letter to the Rt. Hon. Sir James Graham, Bart., M.P., First Lord of the Admiralty. By JOHN COCHRANE HOSEASON, Esq., Commander, R. N. Saunders and Stanford.

THE interests of our Steam Navy, so far as they depend upon details of construction, have received a careful consideration from the author of this letter, whose views on the subject, in many instances verified by the result of experiments which his own ingenuity and perseverance have succeeded in instituting, deserve every means of publication. Capt. Hoseason is one of the comparatively small number of naval officers who devote their attention to questions of this nature, and feel a highly creditable interest in improving the efficiency of the the great arm of the service to which they belong. Under his directions, and proceeding upon principles which his extensive observation and judgment suggested, the steam-sloop *Inflexible* performed a long course of trials, which have very considerably added to our knowledge of the practical working of the system of combined steaming and sailing in the Navy. It is not this subject alone, however, that he has investigated. There is scarcely any one of the numerous matters incidental to the most effective condition of steam-vessels of war which has not, in some way or another, been brought into an improved state, or put in train for advancement.

In the letter before us he calls attention to the most prominent of these, many of his suggestions with respect to which have been honoured with the approbation of some of the most distinguished naval authorities of Whitehall and Somerset-house. Some of the most important parts of the evidence taken before the Select Committee of the House of Commons on the Navy Estimates in the years 1848 and 1849, are here carefully analysed, illustrated by collateral facts in screw navigation, and, in some instances, deficiences in the evidence have been supplied. With the failures before our eyes which are constantly occurring in dockyard productions, and the obvious want of a directing power in dockyard operations of adequate intelligence, our readers will not be surprised to learn that Capt. Hoseason meets with abundant occasion for criticism. Several questions and answers from the Blue-book are paraded before the public eye, not a few of which speak for themselves in language condemnatory of our present system of management.

While assailing the weak points of our naval administration in matters of construction, he does not fail however to offer freely his own remedial arrangements. The faults which he finds extend to the state of knowledge of high officials in their own business; and his proposals virtually embrace the same point. The suggestions he offers, which have not yet been adopted, are numerous, many of them directed to

matters of considerable importance, and all founded upon observation and experience, establishing a favourable probability in their behalf. The most important of them appears to be that of increasing the effective horse-power of the vessels, so as to gain an increase of speed at the necessary sacrifice of a somewhat increased expenditure. Authorities of high repute in the engineering world are referred to, and the entire question is discussed comprehensively, and with ability.

The Cyclopædia of Useful Arts. Edited by CHARLES TOMLINSON. George Virtue.

PART XXIX. of this admirably-conducted work has just made its appearance. Considering how very extensively its literary and artistic merits are known and appreciated, it is almost superfluous to say that this portion of the undertaking is distinguished equally with its predecessors by the great research which Mr. Tomlinson has bestowed upon the past history and present state of each subject of art and science embraced by it, the general accuracy of his facts and figures, the popular and eminently successful manner in which he contrives to convey an extensive and even technical knowledge of the several matters he treats of, and the number and beauty of the illustrative engravings. The valuable article on the paper manufacture, to which we adverted in our last notice of the Cyclopædia, is here continued and brought to a close; presenting a comprehensive and popular, yet substantial, account of that important branch of manufacturing industry. At the close of the part we are left deeply into that new and attractive walk of experimental philosophy, which has now so many ardent votaries—photography. From the pen of Mr. Tomlinson, this subject receives a minute explanation of the philosophical principles upon which its various processes depend, and entering upon the necessary directions for their performance. Between these limits we have some extremely important and highly interesting articles, particularly one on phosphorus and the lucifer-match manufacture, to which we have directed attention in another page, while submitting a letter on the subject from Mr. Tomlinson to the consideration of our readers.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MARCH 11, 1853.

HENRY NEEDHAM SCROPE SHRAPNEL, of Gosport. *For improvements in ordnance and fire-arms, and ammunition or projectiles, and the mode of making up or preparing the same.* Patent dated August 23, 1852.

This invention comprehends—

1. The construction of the barrels of fire-arms slightly enlarged at the inner extremity, for the purpose of admitting of the more perfect expansion of hollow shot when fired from such guns.

2. A sliding sight adjustable to different ranges, and capable of being retained in any desired position, the degree of elevation being indicated by a scale, which enables an officer at any time to direct his men to adopt the exact amount of elevation of the sight required to hit distant objects.

3. The formation of cylindro-spherical shot or shells, with a projecting stem attached to their rear end, which stem is intended to project through a hole in the breech of the gun, from which the projectile is to be fired; by which means six pound shot may be discharged from three pounder guns.

4. A method or form of rifling for fire-arms, which the patentee calls "sphero-elliptic" rifling. An approximation to the form of the interior of the barrel when rifled in this manner, may be obtained by describing about a circle, which is supposed to represent the smooth bore, three equal arcs of greater radius, according to the depth of grooving required, each of these arcs starting from a given point in the circumference of the circle, and terminating at a point exterior to that on the circle where the succeeding arc is to commence. Then by connecting the terminating point of one arc with the starting point of the next succeeding one, by means of radial lines, the figure of the grooving will be obtained. By adopting this system of rifling, the friction is asserted to be reduced, or rather to be more equally distributed over the surface of the barrel than with the ordinary forms of grooves.

5. The attaching of a thick wad of felt, or other material, and a disc of metal, fixed by means of a projecting wire to the rear end of conical shot; the object being to prevent windage by the discharge compressing the wad between the disc and the rear end of the shot, so as to cause it to expand laterally, and thus fill the barrel.

6. The formation of cartridges with shot of the foregoing description, the body of the cartridge being either made by enclosing the powder in paper wrapped round it, or by means of a card-box resembling a pill-box.

JULIUS ROBERTS, of Portsmouth, Lieutenant in the Royal Marine Artillery. *For improvements in the mariner's compass.* Patent dated August 23, 1852.

Lieutenant Roberts' improvements consist in applying a magnet, suspended by one of its ends in a horizontal position over the compass-card, and acting by its magnetic attraction on a vertical magnet, which is attached to the compass-card immediately under the free end of the horizontal magnet, with respect to which it is vertically adjustible. The horizontal magnet is balanced on its point of support by a weighted arm which projects to the opposite side of the compass-card, and from which depends a pointer which serves to indicate, by comparison, the deviations of the compass from the magnetic meridian. In addition to the magnets already mentioned, there is another bar or horse-shoe magnet passed through the centre of the glass-case in which the compass is enclosed, the effect of which is to exert a constant tendency to raise the compass-card from its pivot, and thus maintain it correctly balanced.

Claim.—The mode of constructing and combining the parts of mariner's compasses.

Pierre Amable de Saint Simon Sicard, chemist, of Paris. *For improvements in enabling persons to remain under water and in noxious vapours.* Patent dated August 26, 1852.

1. The manner in which the patentee proposes to enable persons to breathe under the water or in noxious vapours is, by combining with the diving or other dress with which they are supposed to be provided an arrangement of apparatus supplied with oxygen under pressure, which is to be used for mixing with the respired air, and enabling it to be again breathed after having been previously deprived of its carbonic acid, by passing it through a vessel containing a mixture of subacetate of lead and caustic potash, which vessel also forms part of the apparatus before alluded to.

2. In order to supply light when required for conducting subaqueous explorations, the patentee provides a lime-lamp, and combines with it chambers containing oxygen and hydrogen, which are admitted to the lamp in proper proportions to cause the combustion of the lime, which is enclosed, as customary when obtaining light from this source, in a coil of platinum wire.

Claims.—1. The combined arrangements for enabling persons to remain under water or in noxious vapours or gases without being supplied with air from the surface of the water or the external atmosphere.

2. The combination of apparatus for enabling a lamp to burn under water.

George Twigg, of Birmingham, button manufacturer. *For certain improvements in the manufacture of buttons and other dress fastenings, and in the machinery and apparatus to be used therein.* Patent dated August 26, 1852.

The *first* branch of the improvements relates to the manufacture of buttons, of which the patentee describes four different varieties with modifications. The first is a sewn-through button, composed of an inner and outer shell, between which the cross piece by means of which the button is attached is secured. The inner shell is stamped from a piece of metal, with a neck around the central opening, at the bottom of which is a flange to support the cross piece, the arms of which are rounded so as not to cut the threads; the outer shell is also formed with a neck, which fits into that of the inner shell, and the whole of the parts are secured together by turning down the edge of the outer shell over that of the inner one. The second variety is also a sewn-through button, but has only a single shell, the cross piece or a corresponding perforated piece being held in position on the flange in the neck of the shell by indenting a groove from the outside just above it. The third variety is a stud-button, of which several modifications are shown. In this form of button the shank is composed of a piece of metal wire, and is held in place between the shells of the button by the edge of the outer one being turned down over that of the inner one. The button is attached by passing its shank through a hole in the cloth or material to which it is to be secured, a distance-washer having been previously placed on the shank, and upsetting the end of the shank over a washer placed around it. The fourth button is composed of a sphere or ball of any suitable material, covered with silk, mohair, or other fabric; the shank being composed of a wire loop passed through a hole in the centre of the ball, and opened out at the inner end, so as to prevent its being withdrawn. The outer end of the loop can be formed so as to hold a piece of glass or other ornament which may fit nearly flush with the face of the button, by countersinking the end of the hole in which the stud passes.

The *second* branch of the improvements relates to the manufacture of sewn-through buttons, stamped from a piece of metal, and consists in using several drills, so as to round off the edges of the holes simultaneously.

The *third* branch of the improvements relates to the manufacture of clasps. Two forms of these are shown; in the first the connection between the wings is effected by means of a nib with an enlarged head, which takes into a slot formed in the second wing. The slot is of a length to permit the en-

larged head of the nib to enter it when turned sideways, but when in their correct relative positions, the enlarged head prevents the nib working out. The second form is somewhat similar to the first, the attachment being effected by means of a stud instead of the nib before mentioned. There is also in this form of clasp a bar, which is attached at the back of the wings, to enable them to be secured to the garment or article, whilst in the first form a simple slot, cut at the ends, was made to answer the same purpose.

The *fourth* branch of the improvements consists of an arrangement of machinery for milling or rounding the edges of buttons. In this machine the buttons are received edgewise between the faces of two parallel straight bars of steel, which are either milled or grooved longitudinally, according to the effect to be produced on the buttons. Then on one of the bars being moved longitudinally, but still parallel to the other, the button will be rolled along, and receive on its edge the impression of the faces of the bars. In the machinery described, four such pairs of bars are arranged, as to be in operation continuously.

Claims.—1. The improvements in buttons.

2. The improvements in smoothing simultaneously the holes in buttons by means of drills.

3. The improvements in the manufacture of clasps.

4. The arrangement and combination of mechanism for the purpose of milling or rounding the edges, and grooving in the centre of buttons.

PAUL JOSEPH POGGIOLI, of Paris, France, gentleman. *For an improved medical compound.* Patent dated August 26, 1852.

This "improved medical compound" is a composition, or ointment for the cure of neuralgia, rheumatism, headach, and "even gout and sciatica."

The following are the ingredients employed in compounding this ointment, and their proportions:—Hydrochlorite of morphine, 10 grains; extract of belladonna, or atropine, 4 grains; populeum ointment, 300 grains; axunge (hog's-lard) macerated for twenty-four hours in leaves of datum stramonium, 300 grains. The compound may be made either white or coloured, and scented with mint or cherry water. It is applied by gentle friction to the part affected, using about 5 grains; and, in cases of sciatica, 10 grains for each application. The part should be covered up after each application; and three or four such will generally effect a cure.

Claim.—The combination of matters indicated forming a medical compound applicable to the cure of the complaints mentioned.

AUGUSTE EDOUARD LORADOUX BELLFORD, of Holborn. *For improvements in the machinery and apparatus for printing fabrics and other surfaces.* (A communication). Patent dated August 26th, 1853.

This invention consists in the use of sieves and perforated cylinders for the purpose of distributing in spots or speckles, or of sprinkling on the surfaces of woven fabrics, paper, leather, &c.; the colours, mordants, and "rongeants" required for ornamenting the said surfaces. (By the term "rongeants," the patentee distinguishes all such chemical agents as are used either for discharging colours, or for altering their shades or hues).

The arrangement of apparatus which is preferred to be adopted, consists of four sieves properly perforated, placed one above the other in a horizontal position, and supplied with the material or liquid to be distributed from a perforated cylinder, revolving above them. In operating, colours may be applied to a fabric previouly impregnated with a mordant, or the mordant may be sprinkled on the surface of the fabric previously to immersing it in the dye-bath; the application of "rongeants" is conducted in a similar manner. When paper or leather are operated on, the colour should be prepared in such manner as to be capable of drying rapidly; and the surfaces may be either pressed or rolled, or otherwise treated as found most convenient.

Claim.—The mode of distributing colours, mordants, and rongeants, on cloth, paper, stuffs, leather, and all fabrics, and generally on all substances which are susceptible of being dyed or printed by means of sieves or cylinders.

ANDREW CROSSE, of Broomfield, Somerset, Esq. *For improvements in the extraction of metals from their ores.* Patent dated August 26, 1852.

Mr. Crosse's improvements consist in a mode of applying currents of electricity for separating copper from its ores, and consequently other metals from the copper.

The apparatus employed for this purpose consists of a wooden or earthenware vessel, capable of holding from 250 to 300 quarts, at a short distance above the bottom of which is a moveable platinum frame covered with a netting of platinum wire, the meshes being about 1 inch each way. This frame is connected to the positive pole of a Daniell's battery by a platinum wire, covered with a non-conducting material throughout those parts of it exposed to the liquid in the vessel; the negative pole of the battery being connected to a copper wire, from

which is suspended by three smaller wires, in the interior of the vessel, a bowl of wood lined with sheet copper, and covered with a copper-wire netting. The battery in connection with the apparatus should consist of twenty pairs of plates, each in a gallon-glass vessel filled with a saturated solution of sulphate of copper, to which has been added from one-twentieth of one-tenth part of sulphuric acid.

The mode of operating is as follows:—The vessel is partially filled with water acidulated with sulphuric acid; 230 quarts of water and 5 quarts of sulphuric acid being a convenient quantity. About 15 lbs. of the copper ore previously calcined and reduced to powder is then stirred into the liquid in the vessel and allowed to subside, after which the platinum-frame is lowered on to the surface of the ore, and the copper-lined bowl suspended in its place, when the electric current immediately begins to act. It is preferred, however, to allow the ore to remain four or five days in the acidulated water before applying the electric current. The liquid, during the process, should be kept heated even as high as the boiling point, by which the separation of the copper and its deposition in the bowl will be facilitated. The time occupied in effecting this is generally three to four days, when the whole of the copper is removed; the acid liquid and sediment, which will contain any other metals that may have been present, are run out through a plug-hole in the bottom of the vessel. The sediment should be tested, to ascertain if it still contains any proportion of copper; and if so, it can be mixed with fresh calcined ore and again operated on; the liquid does not require any fresh quantity of acid to be added to it during the process, and afterwards it may again be similarly used.

Claim.—The mode of applying currents of electricity for separating metals from their ores.

John Fish, of Oswaldtwistle, Lancaster. *For certain improvements in looms for weaving.* Patent dated August 26, 1852.

This invention consists in so arranging the shuttle-boxes and picking motions on one or both sides of a loom, that the distance between them may be diminished or increased at pleasure, in order to adapt the loom to the production of fabrics of varying widths. Suitable attachments are provided to retain the shuttle-boxes and picking motions in their several relative positions, and the cams and treadles are so adjusted as to enable them to be shifted to a central position in the loom at every change of distance between the shuttle-boxes.

Claim.—The adaptation to looms of shuttle-boxes and picking motions so arranged as to enable their distance apart to be varied for the purpose described.

James Lawrence, of Colnbrook, Middlesex, brewer. *For improvements in brewing apparatus.* Patent dated August 26, 1852.

A full description of this invention with engravings will be given in an early Number.

Specification Due, but not Enrolled.

Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. *For improvements in the application of iron to building purposes.* (A communication.) Patent dated August 26, 1852.

PROVISIONAL PROTECTIONS.

Dated January 15, 1853.

106. Hippolyte Charles Vion. Certain improvements in apparatus for refrigerating.

Dated January 29, 1853.

228. Thomas Hood Wilson. Securing carriage gates, doors, shutters, and sash casements.

Dated February 3, 1853.

292. John Heckethorn. An improved colouring matter for coating or covering the exterior or interior of buildings, some of the ingredients of which such colouring matter is composed being capable of conversion into size, paste, and ground-colour for priming, or giving the first coat or covering to work intended to be coloured with oil paint.

Dated February 16, 1853.

401. Job Cutler. Improvements in the manufacture of spoons and forks, and other similar articles for domestic use.

403. George Gray Mackay. Improvements in the construction of drain-pipes.

404. Joseph Skertchly. Improvements in copying-presses.

405. John Day. Improvements in apparatus for holding and protecting insulated telegraphic wires.

407. John George Perry. Improvements in book-binding, to facilitate the finding of places in books.

409. Wright Jones. Improvements in machinery or apparatus for stretching woven fabrics.

Dated February 17, 1853.

413. James Murphy. Improvements in the permanent way of railways.

414. William Pidding. Improvements in the treatment and preparation of saccharine substances, and in the machinery or apparatus connected therewith.

415. Matthias Walker. Improvements in vessels or apparatus for containing and preserving ale, beer, and other liquors.

416. Charles Gordon. An improved goniometric protractor, or instrument for setting out and measuring angles and other geometric figures.

417. David Cochrane. Certain improvements applicable to closing doors.

419. George Leopold Ludwig Kufahl. Improvements in the application of atmospheric currents to the obtainment of motive power.

420. William Hawes. Improvements in the manufacture and refining of sugar.

421. Charles Watt and Hugh Burgess. Improvements in coating iron with copper and brass.

422. Isaac Frost. Improvements in reaping or cutting crops.

Dated February 18, 1853.

423. James Horsfall. An improvement or improvements in the manufacture of pianoforte wire, applicable also to articles of iron and steel generally.

424. Peter Madden. Improvements in propelling, steering, and regulating vessels.

425. Charles Butler Clough. Certain improved apparatus for detaching boats or other floating vessels from their moorings or fastenings.

426. William Darling. Improvements in the manufacture of malleable iron and other metals.

427. Charles Kinder. Improvements in mantle or chimney-pieces.

428. Henry Noad. Improvements in treating corn or grain, and obtaining products therefrom.

Dated February 19, 1853.

430. James Chadnor White. Improvements in fastenings for harness, and which are also applicable to other like purposes.

431. Frank Clarke Hills and George Hills. Certain improvements in refining sugar, and in preparing materials applicable to that purpose.

432. William Rawbonn Dell. Improvements in the manufacture of cylinders coated with fine wire webbing, for dressing fine flour by the process of gravitation or sifting without the aid of any internal brushes or fans.

433. Charles Cowper. Improvements in the manufacture of oxide of zinc or zinc white, and in apparatus for that purpose. A communication.

434. Charles Nightingale. Certain improvements in drying and heating certain substances or articles.

435. James Anderson. Improvements in obtaining motive power.

436. Pierre Auguste Tourniere. Improvements in propelling.

Dated February 21, 1853.

437. Wright Jones. Improvements applicable to steam pipes used for warming, drying, or ventilating.

438. Samuel Rodgers Samuels and Robert Sands. Improvements in looms for weaving.

439. John O'Leary. Certain improved apparatus for indicating the number of passengers entering in or upon omnibuses, and also their exit therefrom.

440. Joseph Ramage and Thomas Coffey. Certain improvements in the manufacture of chandeliers, gas brackets, and lamp frames.

441. James Mash and Joseph Sharp Bailey. Improvements in weaving machinery employed in the manufacture of textile fabrics, and in the manufacture of such fabrics.

442. William Pidding. Improvements in coverings for the feet of bipeds or quadrupeds.

443. Richard Farrant. An improved chimney-pot.

444. Ezra Miles. Improvements in railway brakes.

445. Thomas Bell and Richard Chrimes. Certain improvements in valves, applicable to the receiving and discharging of water or other fluids.

446. Benjamin Barton. An improved bath, which can also be used as a life-boat.

447. John Charles Pearce. Improvements in steam boilers.

448. John Davie Morries Stirling. Improvements in the manufacture of wire.

449. William Wilkinson. Improvements in the manufacture of ropes, bands, straps, and cords.

Dated February 22, 1853.

450. James Hudson and Thomas Bamford Hudson. Improvements in the manufacture of bricks, tiles, and drain-pipes or tubes.

452. George Winiwarter. Improvements in the manufacture of fire-arms.

Dated February 23, 1853.

454. Samuel Beckett. An improvement or improvements in mule spindles, and spindles of a similar description, for spinning or twisting various fibrous substances, and in the mode of manufacturing and producing the same.

456. Edwin Stanley Brookes, Joseph Black, George Stevenson, and William Jones. Improvements in machinery for the manufacture of looped fabrics.

458. Reuben Plant. Improvements in safety lamps.

460. Samuel Cunliffe Lister. Improvements in treating soapsuds.

462. Adam Cyrus Engert. Improvements in joints for the sticks of parasols, and other like purposes. A communication from Alexander Porecky.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 4th,* 1853.)

44. James Hodgson. Improvements in machinery for draining land.

205. Martin Billing. Certain improvements in the combination of metals having different capacities of vibration, to be used in the construction of certain useful articles.

240. Thomas Turnbull. Improvements in the preparation and treatment of flax, hemp, and other similar vegetable fibres.

344. Samuel Perkes. Improvements in certain apparatuses and machines for the production and treatment of mineral and other substances, and part of which are applicable for other useful purposes.

346. Samuel Perkes. Certain improvements in mines, buildings, and sewerage, for effecting sanatory purposes, and treating the produce therefrom.

406. Andrew Blair. Improvements in printing or ornamenting fabrics.

(*From the "London Gazette," March 8th,* 1853.)

50. Walter Henry Tucker. Certain improvements in locks, applicable to locks for all purposes, by which they can be made so as to combine increased and perfect security with simplicity and cheapness of construction.

82. Henry Mortlock Ommanney. Improvements in certain parts of machinery for spinning cotton and other fibrous substances.

83. Henry Mortlock Ommanney. An improved furnace for melting of metals in crucibles.

89. James Nichols Marshall. An improved wheel for carriages and other vehicles.

131. Henry Mortlock Ommanney. An improvement in the manufacture of guns, cannon, and other ordnance.

132. Henry Mortlock Ommanney. An improvement in the manufacture of cylinders for hydraulic presses and other engines.

133. Henry Mortlock Ommanney. An improvement in the manufacture of wheels for railway carriages.

134. Henry Mortlock Ommanney. An improvement in the manufacture of stamp-heads for crushing ores.

396. James Lochhead and Robert Passenger. Certain improvements in the manufacture of glass and other vitrified substances, and in ornamenting and annealing the same.

405. Allan Edwin Hewson. Certain improved modes or processes for making buttons, beads, and other ornaments of dress.

429. William Harcourt and Joseph Harcourt. Certain improvements in the construction and manufacture of match-boxes.
437. Arthur James. An improvement or improvements in needle-cases or wrappers.
484. George Elliot. An improved method and apparatus for dressing and cleaning flax straw.
499. James Brodie. Certain improvements in the construction of sea-going vessels.
505. William Mackay. Improvements in extinguishing fire in dwellings, factories, and other buildings, and in ships.
524. Charles Rowley. Certain improvements in nails.
527. Joseph Charles Frederick Baron de Kleinsorgen. An improved apparatus for indicating the variation of the magnetic needle.
537 William Robert Bertolacci. An improved pneumatic ink and pen-holder.
541. Thomas Wilks Lord. Improvements in safety and other lamps.
567. Richard Archibald Brooman. Improvements in violins and other similar stringed musical instruments.
572. Henry Brinsmead. An invention for shaking straw to be attached to threshing-machines.
578. Edmund Adolphus Kirby. An improved adjusting couch for medical, surgical, and general purposes.
626. Charles Phillips. Improvements in apparatus or machinery for reaping or cutting crops of corn or other crops, to the cutting of which reaping machines are applicable.
649. Andrew Lawson Knox. Improvements in the manufacture or production of ornamental fabrics.
720. Henry Fletcher. Improvements in the application of electro-magnetism for the production of motive power.
756. Francis Montgomery Jennings. Improvements in preparing flax, hemp, china grass, and other vegetable fibrous substances.
784. Robert Walker. Improvements in the construction of portable houses and other erections.
860. William Hall. Improvements in rotary steam engines, governors, and apparatus for supplying boilers with water, and for regulating the same.
936. John Norton. Improvements in shot or projectiles.
69. Richard Walker. An improvement in the manufacture of buttons.
106. Hippolyte Charles Vion. Certain improvements in apparatus for refrigerating.
136. Joseph Maudslay. Improvements in steam engines, which are also applicable, wholly or in part, to pumps and other motive machines.
171. Henry Brinsmead. An invention for reaping all kinds of corn.
255. Edmund Leach. Improvements in the mode or method of preparing and spinning cotton, wool, flax, and other fibrous substances, and in the machinery or apparatus employed therein.
314. Alfred Woodward. A double-action vertical lever churn.
315. Alfred Woodward. A self-acting cam press.
324. John Campbell. Improvements in the treatment or finishing of textile fabrics and materials.
346. John Seaward. Improvements in marine engines.
367. William Choppin, Improvements in locks.
401. Job Cutler. Improvements in the manufacture of spoons and forks, and other similar articles for domestic use.
403. George Gray Mackay. Improvements in the construction of drain pipes.
404. Joseph Sketchly. Improvements in copying-presses.
405. John Day. Improvements in apparatus for holding and protecting insulated telegraphic wires.
408. John George Perry. Improvements in bookbinding, to facilitate the finding of places in books.
415. Matthias Walker. Improvements in vessels or apparatus for containing and preserving ale, beer, and other liquors.
422. Isaac Frost. Improvements in reaping or cutting crops.
427. Charles Kinder. Improvements in mantle or chimney-pieces.
428. Henry Noad. Improvements in treating corn or grain, and obtaining products therefrom.
431. Frank Clarke Hills and George Hills. Certain improvements in refining sugar, and in preparing materials applicable to that purpose.
433. Charles Cowper. Improvements in the manufacture of oxide of zinc, or zinc white, and in apparatus for that purpose.
434. Charles Nightingale. Certain improvements in drying and heating certain substances or articles.
441. James Mash and Joseph Sharp Bailey. Improvements in weaving-machinery employed in the manufacture of textile fabrics, and in the manufacture of such fabrics.
443. Richard Farrant. An improved chimney-pot.
441. John Charles Pearce. Improvements in steam boilers.
448. John Davie Morries Stirling. Improvements in the manufacture of wire.
450. James Hudson and Thomas Bamford Hudson. Improvements in the manufacture of bricks, tiles, and drain pipes, or tubes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS..

Sealed March 5, 1853.

182. Samuel George Archibald.
228. William Edward Newton.
229. William Edward Newton.
256. John Cronin Jeffcott.
269. William Vaughan Morgan.
401. William Edward Newton.
442. William Newton.
676. William Edward Newton.
690. James C. Booth.
692. William Edward Newton.
722. George Kendall.
816. William Edward Newton.
966. James Buchanan.
1041. Alfred Vincent Newton.
1079. Sir Francis Charles Knowles.
1163. Alfred Vincent Newton.
31. William Lewis Sheringham.
40. William Beales.

Sealed March 9, 1853.

23. Jean Baptiste Lavanchy.
140. Thomas Robson.
153. David Stephens Brown.
164. John Robert Johnson.
168. John Macintosh.
238. William Gilbert Elliott.
521. John Cass.

633. Harrison Blair.
768. John Whealy Lea and William Hunt.
793. John Robert Johnson.
815. John Whealy Lea and William Hunt.
882. Antonio Fidele Cossus.
908. Francis William Ellington.
987. Alfred Vincent Newton.
1101. Thomas Elliott.
1126. William Edward Newton.
1130. Alfred Vincent Newton.
1135. William Aspdin.
1136. John Copling, junior.
1191. William Edward Newton.
6. Thomas Billyeald.
32. Edward Hutchinson.
41. Peter Graham.
50. Richard Gittins.
66. John Davie Morries Stirling.
72. James Thornton, John Thornton, and Albert Thornton.
73. Joseph Robert Wilkin Atkinson.
86. Edward Haslewood.
89. John Bennett and Henry Charlesworth.
101. William Steads.
121. Henry Browning.
123. Orlando Reeves.
130. Sydney Smirke.
132. Warren Fisk Shattuck.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Feb. 25	3427	Hargraves, Harrison, and Co.	Wood-street	Parasol joint.
Mar. 3	3428	E. Thornton	Huddersfield	Gas-retort.
,,	3429	C. B. Curtis	Lombard-street	Screw nozzle for powder-canisters.
7	3430	J. Taylor and Sons	Warwick-lane	Syringe.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Feb. 28	493	J. Morris	Clapham-road	Corkscrew.
Mar. 4	494	N. Ager	Pimlico	Valve.
5	495	A. J. Schott	St. James's	Drum-castanet.
10	496	W. G. Haig	New North-road	Watch-protector.

Erratum.—Page 185, second column, tenth line from the bottom, *for* "Wood-street," *read* "Moor-street."

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Mechanics' Magazine.

No. 1545.] SATURDAY, MARCH 19, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

M'CONOCHIE'S PATENT RAILWAY CHAIRS.

Fig. 1.

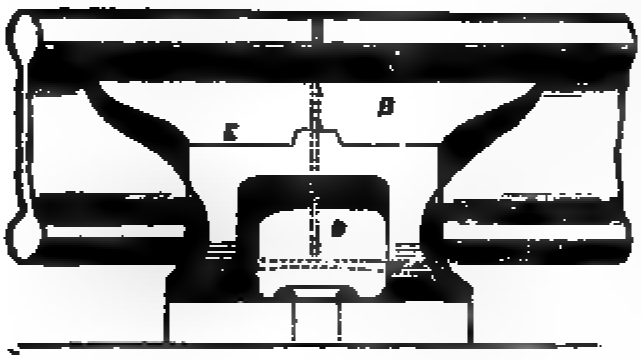

Fig. 4.

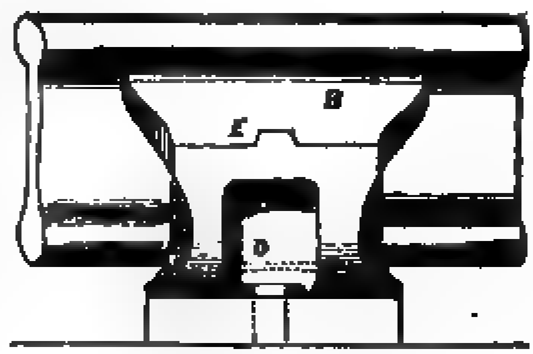

Fig. 2.

Fig. 5.

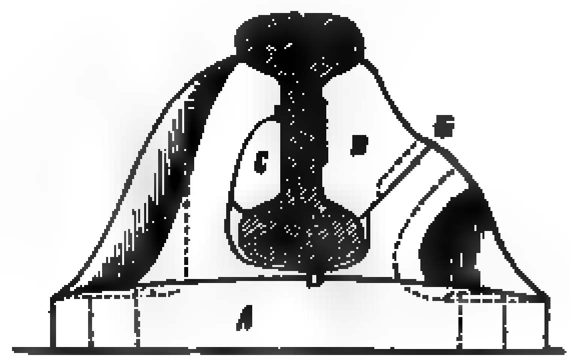

Fig. 3.

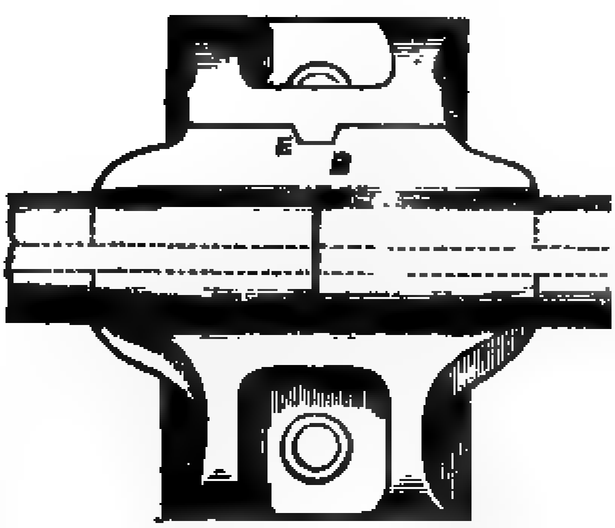

Fig. 6.

Scale ⅕th 0 3 6 9 12 Inches

M'CONOCHIE'S PATENT RAILWAY CHAIRS.

(Patent dated June 24, 1852.)

The consideration of the best means of increasing the durability of that part of the permanent way of railways which consists of its rails and chairs, has received much attention of late from practical engineers, the subject having been brought more prominently into notice by the wear and tear, or destruction that takes place in this portion of railway plant; the double-headed rails becoming in some places unfit for use within five or six years from the time they are laid down. The cause of their so soon becoming deteriorated seems mainly to arise from the insufficiency of the common description of chair. This insufficiency is clearly proved by the thousands of tons of rails that are now being returned into different works as old iron, the bottom head being almost as sound as when rolled, except having indentations every three feet where the chairs have been fixed; the rails being thus so much damaged as to be unfit for reversing, according to the original intention. Such being the case, it proves the importance of using some description of chair which will support and secure the rail without injury to its durability.

The railway chair invented and patented by Mr. John M'Conochie, of Wednesbury, which, it is believed, will meet this requirement, and increase the durability of the rails from 25 to 50 per cent., was thus described in a paper of Mr. M'Conochie's, which was read before the Institution of Mechanical Engineers at Birmingham, on the 26th of January last:

Figs. 1, 2, 3, 4, and 5 represent the chair as supplied to the Liverpool, Crosby, and Southport Railway, and show its nature and object. Fig. 1 is a joint chair on the inner side; fig. 2 a joint chair on the outer side; fig. 3 the plan of a joint chair; fig. 4 an intermediate chair; and fig. 5 an end view of the chair and rail. The chair consists of two parts—first, the body A, and secondly, the abutment-piece B; the key C is made of either wood or iron, but the former is preferred; a space D, of about 1-8th of an inch, is left between the lower head of the rail and the sole of the chair; the fillet E fits loosely into the groove cast in the abutment-piece, which prevents the possibility of its being driven out of the chair. The weight of the joint chair here shown is 35 lbs., and the weight of intermediate chairs for the same section of rail averages 26 lbs., which is not more than the weight of the ordinary description. When it is desirable to remove the rails, the operation is as follows:—The lock-key C is driven out, which allows the rail to rise vertically out of the chair, carrying with it the abutment-piece, so that the operation of turning the rail is performed as easily as when the common description of chair is used. In the latter the support of the rail is entirely dependent on the wooden key, whereas the improved chair forms of itself a self-acting fastening for the rails, thereby offering considerable facilities for laying in, repairing, or relaying the road. Besides, as trains may pass over them immediately the rail is laid in, before keying up, it shows the comparatively unimportant office the wooden key has to perform in these chairs, in comparison with those in ordinary chairs. In the latter the keys require continual replacing and supervision, which forms a considerable item in the maintenance, both in superintendence and materials; in the improved chair the office of the wooden key is simply to lock the rail in the chair, thus forming a more complete bond between the rail and the sleeper.

It may be observed at the same time, that several of these chairs have now been in use three or four months without any keys, the lateral force of the abutment-piece serving to some extent as a key to them. This point of superiority of the improved chair over those in common use should not be overlooked; for if the keys in the latter are omitted, or get loose and work out, it is to the peril of the trains that pass over them; while in the new chair it has been proved that such an omission is not attended with any danger, except under extraordinary circumstances, where there may be a liability of the earthwork slipping.

The prominent feature in the improved chair consists in its preserving the lower head of the rail from injury, while the upper one is in use, by supporting the rail, as shown in fig. 5. The object being to obtain the maximum amount of wear out of a given quantity of material, by wearing down successively the top and bottom surfaces of the rails.

The durability of the rails greatly depends on the strength and steadiness of the fastenings, which is one of the advantages of this chair, from the fact of downward pressure tending to tighten its hold on the rail. This is an important point, as, theoretically, chairs to be perfect, should be as tight to the rails as if they formed a part of them. The fact of

the ordinary chairs being an inefficient fastening, has led to the abandonment, in many instances, of the double-headed section of rail, notwithstanding its many advantages when used in combination with transverse sleepers. In the opinion of the writer, by the adoption of the present method of fishing at the joints, combined with better intermediate fastenings than the ordinary chair, the double-headed rail and transverse sleeper cannot fail to outlive all the expedients which have been resorted to of late years to supersede this construction of permanent way, which is common to the northern districts, the fatherland of railways.

The ordinary fastenings are loosened and deteriorated principally by the alternate upward, downward, and lateral pressure, from the deflexion of the rails between the supports. In the improved chair, the combined action of the lock-key and abutment-piece prevents this injurious action going on, as in the ordinary chair, in the comparative ratios (as shown by experiment) of from 50 to 100 per cent., according to the different weights applied.

With the ordinary chair, the tendency of the rail to get bent and crooked operates very materially to lessen its durability; for in some instances, even if the lower head were not notched, it would not be fit to reverse unless straightened, and the fibres consequently disturbed, &c.; but with the improved chair, the liability to get bent is greatly lessened by the additional stiffness these chairs give to the rail.

Another modification of the improved chair is shown in fig. 6. It presents more bearing surface to the rail than any other joint chair in use, consequently it greatly strengthens the rail at the joint. It differs from the chair already described in having two abutment-pieces instead of one, which are made fast by wrought-iron keys, as shown at I I: when the keys are backed, the rail can be lifted vertically out of the chair.

The results of some experiments made some time back, by Mr. James Samuel, upon the rails of the Eastern Counties Railway, by interposing gold-leaf between the rail and the chair, showed that the amount of surface in contact between the rail and their ordinary intermediate chairs was 1½ square inches. This appears a liberal calculation, but if we take it as an approximation, it gives a result of rather more than 6 to 1 in favour of the improved chair; for as the two jaws of the chair are together equal to 12 inches in length, and as the width of their contact with the neck of the rail may be taken at ¾ths of an inch, the total bearing surface is 9 square inches, instead of 1½ inches. Therefore, if we take the weight of an engine driving-wheel, going along at the rate of 30 or 40 miles an hour, to be equal to a force of 9 tons, this would throw a pressure of 6 tons on the square inch on the 1½ square inch of rail in contact with the sole of the common chair; but it would only amount to 1½ tons per square inch on the underside of the head of the rail in the improved chair; so that, while the former pressure is sufficient to indent the rail, the latter will probably prove quite harmless.

Objections have been raised to this chair on the ground that the tendency of the jaws will be to tear the head off the rail. This would be the case if the jaws were tapered to an edge, instead of being rounded to the same curve as the underside of the head of the rail, the part in contact with it. With an edge they would by degrees work their way into the head of the rail, until, lamination taking place, a separation of the top from the bottom part of the rail would ensue. The writer understands that something of this sort took place on the London and Birmingham Railway with some of the first chairs laid down. In these chairs a portion of the weight was carried on the sole of the chair, as in ordinary chairs at the present time; but in order to give greater support to the rail, the arm of the chair opposite the key bore right against the head of the rail; it was found, however, that as soon as the under head began to bed into the chair, the whole of the weight came on the top of the arm or side of the chair, against which arm it was backed up, though inefficiently, by the key on the other side of it; but the chair, being only the same width as the common one, did not present much bearing surface to the rail: the weight then bearing on such a narrow surface caused the head of the rail to be indented and injured, and, consequently, the attempt to support the rail at these two points at the same time was abandoned. The failure of these chairs, however, cannot be taken as an argument against the success of this improved description. For example, a strong pair of shears, while its edges are square and sharp, will cut through the thickest boiler-plate; to this the chairs just alluded to, which injured the rails, may be compared; but if the cutting edges of those shears were rounded, and the surface increased, then the strongest machine that was ever yet constructed for shearing would be unable to effect an incision; in like manner the improved chairs, with their edges rounded to the curve of the rail, and extended longitudinally (as shown in the figures) would be unable to cut, but merely hold the rail secure.

The following are the principal advantages of this chair:—1st. The lower head of the rail is preserved free from injury while the upper one is in use. 2nd. The abutment-piece,

or loose jaw, forms a self-acting fastening. 3rd. The improved chair gives the rail great additional stiffness, vertically and laterally. 4th. The length of the jaws of the chairs causes the distance of unsupported rail between chairs placed the usual distance apart to be less than with those in ordinary use. 5th. This chair, by preventing the ends of the rails lipping, and securing level joints, lessens the wear and tear of the rolling stock, and promotes ease in travelling. 6th. The keys require much less attention, as their office is not to support the rail, as in the common chair, but only to keep it from rising in the chair. 7th. The above advantages are secured at a very slight extra expense on the first cost of the chair.

In conclusion, it may be stated, that the engineers who have adopted the improved chair, admit that the advantages here enumerated are so far fully born out in practice.

[In a future Number, we propose to give some account of the experiments made by Mr. Marshall on these chairs.]

LONDON FIRES IN 1852. — PART III.

TWENTY-SECOND ANNUAL REPORT. BY MR. WILLIAM BADDELEY, C.E.

The causes of fire during the past year, it will be seen, do not present any remarkable feature of novelty. The discharge of fire-arms has caused two fires, but neither of them were very serious in their consequences. One of these accidents happened in Highbury-grove, Islington, shortly before 11 o'clock in the evening of July 5. About an hour previous, one of the inhabitants thinking an attempt was being made to enter his premises for the purpose of robbery, discharged a gun, as a caution to the intruders; the wadding falling among a quantity of shavings in an unfinished building set fire thereto, and threatened to destroy it; by the prompt and active exertions of the police and neighbours however, the fire was soon extinguished. Soon after two o'clock in the morning of January 26, a fire occasioned by a cat did considerable damage to the premises of Mr. Bryan, grocer, &c., in Queen's-place Holloway. It appeared that pussy in her nightly perambulations came upon the stock of lucifer-matches, which by her awkward mode of handling, she contrived to ignite; the inflammable contents of the shop were soon in a blaze, and the premises seemed doomed to destruction. The prompt arrival and judicious application of the Holloway fire-engine, however, confined the damage to the shop and parlour,—in the latter of which was found the dead body of the feline incendiary; pussy having died of suffocation.

A fire caused by *rain*, is about the last thing that would be supposed capable of producing such a calamity; several of last year's fires were, however, so occasioned. The rain slaking of lime produced so much heat as to ignite combustible matters in contact therewith.

A singular fire broke out in Lincoln's-inn Fields on Wednesday evening, August 4. A large wagon belonging to Messrs. Younghusband and Co., railway-carriers, laden with hemp, was being driven through the square, when all at once a body of flame burst forth from the hemp; the horses being detached, the wagon was upset and the burning mass thrown into the road. The brigade-engine, from Holborn, with a body of firemen had to be called in to extinguish the fire, the origin of which could not be very well accounted for. Spontaneous combustion, or unextinguished tobacco is supposed to have been the cause.

The necessity of more attention being given to the regular cleaning of chimneys is shown by the fact, that in no less than thirty-four instances chimneys on fire proved serious matters. "Oh its only a chimney on fire—there's no danger" is an every-day remark. On the 20th of April last, the firemen were called to a fire at No. 10, Dorset-square, Marylebone; the inmates observed "there's no danger," and refused admittance to the firemen. In one hour after the mistake was made manifest, and the firemen's aid earnestly solicited. The fire had communicated to the joists and rafters, several of which were burned, the ceilings in back and front rooms pulled down, and the contents much injured.

Total Losses.

Upon twenty-five occasions the premises in which the fire originated were totally destroyed—the number of buildings destroyed being thirty-one. This result is attributable in nineteen cases to the fire having obtained a great head before it was discovered. In nine cases the fires were so far distant from the nearest engine-station as to preclude the possibility of timely aid. The total destruction of Mr. Hogg's premises (September 19) was occasioned by breaking open the street-door to try to save the inmates. Four total losses were owing to late and scanty supplies of water. An important trial, as regards Water Companies,

took place recently at Bristol. The premises of a cabinet-maker, named Laverton, carrying on an extensive business in Red-cross-street, were discovered to be on fire at two o'clock in the morning of September 2nd. The firemen promptly attended with their engines, but no water could be obtained from the mains for upwards of two hours, and the sufferer brought an action against the British Water-works Company for the amount of his loss. Mr. Baron Platt observed, that "there was a stipulation in the Act of Parliament, that the Company should give protection to the public, and, in case of fire, water was to be ready to extinguish it. It was part of their bargain that they should afford that benefit to the public, as part of the service for which they were paid and the monopoly given them. It was the duty of the Company to keep their mains full, and it was a serious dereliction of their duty to have neglected it." The jury returned a verdict for the plaintiff for the amount of his loss, 531*l.* 18s. 7d.!

The remaining total loss was the destruction of the manufactory and stores of Phillips's Patent Fire Annihilator Company in Battersea-fields, on Sunday, October 31st, which was attended with loss of life. About eleven o'clock in the forenoon, a large quantity of composition, which was drying in the oven or drying-stove, ignited with a loud explosion, and immediately fired the premises. The wife of the watchman, the only person at that time on the premises, appears to have been either killed by the explosion, or suffocated by the noisome vapour with which the place was instantly filled. After the fire had been extinguished, the poor woman was dug out of the ruins, sadly mutilated.

Considerably damaged.

At no less than 208 fires considerable damage was sustained, and in this class are to be found some of the heaviest fires of the year: in nineteen instances the premises were "all but destroyed."

Presentation of Plate to the Secretary of the West of England Fire-office.

A most interesting scene took place on Tuesday, 20th April last, at the London Coffee-house, when 135 Agents of the West of England Insurance Company presented a magnificent service of plate to Charles Lewis, Esq., the respected Secretary of that enterprising Company. The articles presented consisted of a handsome chased salver, a kettle and stand, an inkstand with candlestick, a cake-basket, ladles, gravy-spoons, forks, teaspoons, &c. In order to give full effect to their present, the greater number of subscribers, from all parts of the United Kingdom, attended the presentation. After a sumptuous banquet had received ample justice, James Anderton, Esq., the Chairman, addressed Mr. Lewis on behalf of the meeting, in a neat and elegant speech, in which he said: "In presenting this Testimonial to you, Sir, I am happy to inform you that I do so in the presence of gentlemen from Scotland, Ireland, and Wales, as well as England—aye, from every part of England, who come to show their respect to you, and to evidence to you the estimation in which they hold you. I have stood in this room, Sir, many times, but never did I feel more pleasure than I do at the present moment, while I tell you that this magnificent memorial which lies upon the table before you is the free-will offering of a body of men who know you well, and who are capable of estimating real merit wherever they may find it. I hope that you may live many years to enjoy it, and that you may look upon it with pleasure; and further, I hope that those to whom it may descend may know that it was through your integrity and industry that it was so descended. It only remains for me to read to you an expression of feeling, which has been put into my hands for that purpose, by the subscribers to the Testimonial. These are the words:

"'TO CHARLES LEWIS, ESQ.

One hundred and thirty-five agents of the West of England Insurance Company, in various towns and districts of the United Kingdom, offer for your acceptance the accompanying articles of plate, as a slight testimonial of their affectionate esteem and respect. Nearly half a century of your life has been devoted to the service of the Company. To it you have given an industry, energy, urbanity, and a consummate skill and ability, rarely equalled, which have been crowned with the success they both merited and commanded. You were associated with the Company in its infancy; you have developed it to its maturity; you found it in the comparative insignificance of a local office, and they now congratulate you on having raised it to the proud position of one of the first establishments in the kingdom—prosperous and confided in, and still gaining increased prosperity and renewed confidence. In various periods they have been severally associated with you, and this Testimonial is intended more particularly to represent their sincere attachment to yourself, their admiration of your many and signal talents, their acknowledgment of the kindness and courtesy uniformly experienced at your hands, and your generous appreciation of their endeavours

to co-operate with you in the work to which you have devoted your life. To the expression of their united esteem and affection, they add their sincere wishes for your happiness and prosperity, and earnest prayers that your life may long be spared.' "

Mr. Lewis having acknowledged the honour done him, in a speech replete with feeling, and a number of appropriate toasts having been drunk, the meeting broke up, never to be forgotten by any of those who had the privilege of being present.

At a recent meeting of the Plymouth Town-council, the Mayor and several other speakers took pleasure in adverting to the assiduous services of Mr. Marshall, the indefatigable agent of the West of England Insurance-office, and considered themselves and the town greatly indebted to that gentleman for the promptitude and energy he had invariably displayed upon all occasions of fire.

Certain it is that the West of England Insurance Company have been peculiarly fortunate in all their servants; and it is devoutly to be hoped, that as time removes the present staff, others may be found worthy to succeed them.

Death of two Firemen.

Shortly before seven o'clock in the evening of Thursday, July 15th, a most disastrous conflagration broke out in the premises of Messrs. Conbro and Potter, ship-chandlers, No. 2, Haydon-square, Minories. Fire-engines from the various stations rapidly arrived and were placed in the most commanding positions; that from the Whitecross-street station was taken into Swan-street, in the rear of the burning premises, to protect the houses on that side. John Crampton, senior fireman, was holding the branch-pipe, and Alfred Wilson, engineer, was standing by his side giving directions, when one of the lofty walls suddenly fell outwards, burying both the unfortunate men in a mass of bricks, &c. The greatest exertions were immediately made to extricate the sufferers. Crampton was first got out, dreadfully crushed and quite dead. Soon after the bleeding body of Wilson was dug out, and, life not being extinct, he was taken to the London Hospital, where he almost immediately expired. At an inquest held upon the following day, the jury returned a verdict "that the two deceased lost their lives, casually and by misfortune, through assisting in extinguishing a fire in Haydon-square, but how the said fire occurred there is no evidence to prove." On the following Monday, the remains of Crampton and Wilson were buried at St. Luke's, with all the tokens of respect which a sense of their worth, and regret for their untimely and melancholy death, could suggest. In addition to a numerous attendance of mourning relatives, the followers included Mr. Braidwood, the superintendent; Messrs. Fogo, Colf, Staples, and Henderson, the district foremen, and as many of the firemen as could be safely withdrawn from other duties; a body of fire-escape conductors, and a large number of the City and Metropolitan Police from the G and H divisions: the attendance of the greater portion of those parties being for the most part voluntary.

In his Official Report to the Committee of the London Fire-Engine Establishment, Mr. Braidwood says: "Wilson and Crampton were two of the best firemen of their standing in the establishment."

They each left a widow and four children. The Committee have kindly allowed Mrs. Wilson 16*s*. and Mrs. Crampton 13*s*. per week.

The Floating Fire-Engine,

As intimated in my last, has been fitted with steam-power for working the pump, so that no future inconvenience will arise from a deficiency of manual labour. Propulsion by the jet has been attempted without any better success than I predicted, and in consequence of its increased draught of water, much difficulty will always be experienced in conveying this powerful agent to distant fires.

Mr. Braidwood reports that this engine is now double the power it formerly was. The arrangement of the steam-engines and mode of working the pumps is exceedingly good, and is capable of discharging an immense quantity of water, but from malformation of the water-passages, and from other causes, the character of the jets is sadly defective, and the height at which they are delivered by no means equal to what might be expected from the power employed.

13, Angel-terrace, St. Peter's, Islington,
February 25, 1853.

THE TRADES OF BIRMINGHAM.

THE last advices from Australia, brought immense orders for Birmingham goods. Implements of husbandry, workmen's tools, and firearms constitute the bulk of these demands. There are now persons preparing to sail with large stocks of these articles, but the great difficulty in most cases is to obtain the execution of the work by manufacturers, and more especially by the gunmakers. A supply of pistols even to a comparatively small amount can scarcely be obtained as a favour.

With the return of fine weather the outdoor work of the town is considerably reviv-

ing. At the Grand Central Station, in New-street, a great number are engaged: the immense roof is just assuming shape, and it is expected that another month will find the whole of the girders in their places. The works of the Great Western Railway, both in the centre of the town, and along the new line to Wolverhampton, give employment to vast numbers.

The steel pen trade is exceedingly brisk. At this season of the year the manufacturers are generally busy; but some large orders received within the last fortnight from France, and other parts of the continent, for fine points, have caused increased activity in the trade. Messrs. Howick and Wells and Mr. Joseph Gillott, and other principal makers, have constant employment for the thousands employed in their works.

The cut nail business at the present time is in an unsettled state. The make, in consequence of the facility of manufacture afforded by machinery, is apparently beyond the demand, and the present high price of iron, as a matter of necessity, operates restrictively. One cut nail manufacturer has in stock 300 tons of iron and 80 tons of nails; and instead of, as formerly, executing orders for nails to the amount of 1,400*l.* weekly, his business returns do not amount to 100*l.*

The demolition of the celebrated Soho Works, known in former years as the establishment of Messrs. Boulton and Watt, is a somewhat interesting event in the history of Birmingham manufactures. The engine business is still carried on to a greater extent than ever by the present enterprising firm, but that portion of the old works known as the Mint, and which for a considerable period supplied the copper coinage of the realm, has within these few days been levelled with the earth, and the birthplace of those splendid medallions in commemoration and illustration of the natural glories and achievements of the last century is no longer visible to the eye of visitors.

In connection with the Soho Works and the present state of the copper trade, it may be mentioned, as a singular fact, that at the present time there are persons about the country collecting the old Soho penny-pieces, for the purpose of selling them, at a profit, as old copper. It requires 17 of the old penny coins to weigh a pound, and these, it is stated, are being purchased at such a rate as to ensure the purchaser a profit. The difference in the weight of the old and present copper coinage is just one-third. Eight of the old pennies will weigh twelve of the last new penny coinage. The quality of the coin is deemed far superior to the copper now in general use.

The export returns for the month of February, 1853, have appeared, and show a considerable increase over those of the same month last year. The value of the business done stands thus:

Month ended Feb. 5th, 1852..	£4,821,781
" " " 1853..	6,231,841

showing a balance in favour of this year of upwards of 1,400,000*l.* This increase is of course in part to be attributed to the advance which has recently been made upon the raw material and manufactured goods; but the extraordinary demand for goods for Australia may be said to be the premiary cause.

In hardware and cutlery there has been an increase of at least 53,880*l.*; machinery, 67,123*l.*; iron, 297,725*l.*; steel, 21,760*l.*; lead, 436*l.*; tin (unwrought), 2,495*l.*; tin-plates, 2,688*l.*; glass manufactures, 9,235*l.* Copper and brass are a little on the decline; but, with these exceptions, all the metal trade have increased in their transactions.

THE IRON TRADE.

Birmingham.—The near approach of the quarterly meetings of ironmasters renders any partial alteration of prices of little consequence to general traders. Sales for speedy payment may be made at lower quotations than those fixed in January, but iron of the best make continues firm, and orders for plates, bars, and rails are abundant. The *Birmingham Mercury* states that the pig-market is very dull, and that speculators feel great difficulty in effecting sales further than the contracts which were made last quarter day. The make of pigs is evidently in excess of the power and capabilities of the manufacturers to convert them into plates, bars, rails, and rods. This, of course, is one of the causes which militate against the price of pigs, as there is no doubt that in England, Wales, and Scotland nearly 1,500,000 tons of pigs have been made within the last six months; hot blast mine pigs remain at 5*l.* 10s., plates 13*l.*, and rods 11*l.*

Glasgow Pig Iron-Market.—Glasgow, March 12.—Our pig-iron market, which had been depressed during most of this week, under influence of sales on southern account, has suddenly rallied, and prices have advanced about 2s. per ton on all descriptions. To-day m. n. warrants may be quoted 53s. 6d.; No. 1 g. m., 54s.; No. 3, 53s.; No. 1 Gartsherrie, 55s.

America.—By the royal mail steam-ship *America*, which arrived at Liverpool on Monday with advices from New York to the 1st inst., we learn that in the market of that city Scotch pig iron was in good demand at 38 dollars per ton.

THE WATER SUPPLY IN PARIS.

The engineers of Paris recently proposed a plan by which water was to be distributed in the higher portions of the capital in the north and south, and to effect, generally, ameliorations in the present mode of supplying water. The surface of Paris, with respect to the distribution of water, may be divided into two parts, one lower than the basin of La Villette, and the other higher. The first portion, according to the treaties passed between the city and the canal company, has a right to 5,000 inches of water from the Ourcq, but at present, in consequence of the narrowness of the pipes it does not receive more than 2,500 inches. It is intended in this part to enlarge the existing pipes, and lay down others, so as to materially increase the present quantity of water distributed. The plan proposed for this purpose estimates the cost at 1,300,000f. 52,000*l.*

For the quarters of Paris which, on account of their elevation, cannot receive the water of the Ourcq, the question is a more difficult one. On the elevated parts of the left bank, the supply coming from the waters of the Arcueil, from the Artesian well of Grenelle, and from the forcing-pump at Nôtre Dame is insufficient, and will become still more so by the intended suppression of this last-named piece of machinery. On the right bank the great development which the capital has assumed on the high grounds renders some prompt measure for supplying those quarters with water absolutely necessary. It is, in consequence, proposed by the engineers—first, to erect one reservoir of 1.800 metres at Chaillot; a second, of 10,000 metres, at Montmartre; and a third, of 1,000 metres, at the Barrière des Amandiers; secondly, to lay down large and small pipes for the supply of these reservoirs and for the distribution of water in all the elevated quarters on both sides of the Seine. The cost for effecting this will be 1,500,000f., which, with the 1,300,000f. already mentioned, will give a total of 2,800,000f., 112,000*l.*

This plan was, some short time back, laid before the municipal council for approbation, and that body has decided on its adoption. The council also gave its decision on another point submitted to its consideration by the Prefect; namely, the rate of subscription for water in Paris. The present tariff fixes at 5f. a year the daily supply of a hectolitre (rather more than 22 gallons) of water of the Ourcq, and 10f. a year for the same quantity of water from the Seine, from the source, on the north, and from the Artesian Well. These prices have remained invariable, no matter what quantity was supplied. Experience having shown that thes prices were an obstacle to a great consumption of water in industrial purposes and in establishments of public utility, the administration of Paris has consented to reductions of tariffs in favour of the Salpêtrière, of the Hôtel des Invalides, the barrack of the Military School, the Lyons and Strasburg Railways, and some other large establishments. The council has now decided to extend these reductions further. Up to fifty hectolitres a day the price remains as it was, but over that quantity the tariff is to be regulated as follows:

	Ourcq.	Seine and other Water.
From 51 hect. to 100......	4f.	8f. per hect.
From 101 hect upwards...	3f.	6f. —

In addition to these reductions, the water of the Seine is to be supplied at the tariff of the Ourcq when there is but one kind of water distributed in any particular street. All these changes have been formally voted. —*Galignani.*

DR. O'SHAUGHNESSY AND ELECTRICAL WIRES.

To the Editor of the Mechanics' Magazine.

Sir,—In a letter published by Dr. W. B. O'Shaughnessy, of the Hon. E.I.C., in the *Times* of Friday last (11th), he therein declares himself the inventor of "Over-ground Telegraph Conductors" in the year 1839.

In 1746, Winkler, at Leipsic, had telegraphic communication in connection with a long wire.—3 *Annals of Elec.*, 445.

In 1748, Watson did the same, on an extended circuit of four miles.—*Ib.* 445.

In 1784 or 1787, Loneard did the same on a wire from room to room.— *Vail's Hist.*, 121.

In 1798, Betancourt sent electricity a distance of twenty-six miles.

Same year, Salva, at Madrid, worked many miles of telegraph.—3 *Annals of Elec.*, 446; *Vail's Hist.*, 121.

In 1807, Soemering, at Munich, erected a galvanic telegraph.—3 *Annals of Elec.*, 448.

In 1816, Ronalds, at Hammersmith, operated a telegraph, with clocks, eight miles. —*Ib.* 449.

In 1827, Harrison G. Dyer constructed a telegraph on Long Island, State of New York, America, at the race-course, by wires on poles, using glass insulators.—(*See* Evidence in case of T. O. I. Smith *v.* Hugh Downing *et al.*, District Massachusetts; May term, 1850.)

In 1837, Steinheil "had at the Royal Observatory" an "electric magnetic telegraph," half a mile long, on poles.

Yet, two years after this last, Dr.

O'Shaughnessy dates his (so called) invention. Comment is needless; the public, at all events, should be put right on this matter.

JOHN W. WILKINS.

5, South-square, Gray's-inn.

ROASTING BY GAS.

DURING the past week, two trials have been made on a large scale of practice, at Greenwich Hospital, under the direction of M. Soyer, the distinguished professor of the gastronomic art, to ascertain the economy of roasting by gas. The experiments were made in the presence of the Governor, Sir C. Adam and lady, Sir J. Liddle, M.D., Lieutenant Rouse, General-Superintendent Lieutenant Monk, and Messrs. Lee and Seville, Inspectors of Works, and the apparatus employed was one constructed by, and under the patent of, Messrs. Smith and Phillips, of Skinner-street, Snow-hill, which was noticed in No. 1473 of the *Mechanics' Magazine*.

The first experiment took place on the 8th inst., when thirty-six legs of mutton, weighing together 288 lbs., or on an average 8lbs. each, were roasted at a cost of fourteen pence. This result being conclusive on the general question of economy, it was determined to have a further trial, in order to ascertain the merits of the principle in detail.

The second experiment was tried accordingly on the 11th inst., on which occasion equal weights of mutton were cooked; and the following results were obtained:—Twenty-three joints, weighing 184 lbs., were roasted at a cost of 10½d., with gas supplied at 4s. per 1,000 feet. When cooked, the above weight of meat was found to weigh 145 lbs., dripping 19 lbs., and gravy, or osmazome, 2¾ lbs.; thus showing the actual loss to be 18¾ lbs. Twenty-three joints of mutton were also cooked in the usual way, as adopted at the Institution; namely, in one of Count Rumford's ovens, hitherto considered the most economical. When put in they weighed 184 lbs., when done 132 lbs., dripping 18 lbs., gravy none; thus showing a loss of 34 lbs. The coke consumed in this oven was 102 lbs., coal 30 lbs.—thus proving the great economy of gas over the oven by a saving of 13 lbs. of meat, 1 lb. of dripping 2¾ lbs. of gravy. The value of the saving is as follows:—Meat, at 6d. per pound, 6s. 6d.; dripping, at 5d. per pound, 5d.; and gravy, at 1s. 6d. per pound, 4s. 1½d.; making a total of 11s. 0½d.

The saving in time and trouble appears still more remarkable; for the gas being lighted, the dome of the apparatus is opened, and the meat put into it, when it is again closed. M. Soyer and everybody retires from the kitchen, which is locked up, and allowing two hours and twenty minutes for the cooking, it is found perfectly effected. All the authorities of the hospital present, and the connoisseur, expressed themselves extremely well pleased at these satisfactory results.

INSTITUTION OF CIVIL ENGINEERS.

THE discussion on Mr. Daniel C. Clark's Paper—"An Experimental Investigation of the Principles of Locomotive Boilers"—was resumed at the ordinary weekly meeting of the Institution on Tuesday, and, not being then brought to a close, will be again resumed at next week's meeting. We reserve our report accordingly.

LACON'S BOAT LOWERING TACKLE.

AT the twelfth ordinary meeting of the Society of Arts, a paper, by Mr. William Lacon, "On the Management of Ships' Boats, and Loss of Life at Sea," was read by the Secretary, in the absence of the Author, whose improved mode of lowering boats was therein explained. Mr. Lacon's invention has been described, with detailed drawings, in Vol. 57, page 195, of the *Mechanics' Magazine;* but the extreme importance of the subject at the present time, when so many and such lamentable losses of life have occurred from the want of a proper mode of lowering ships' boats, will probably render acceptable the following brief account of it.

In the ordinary mode of lowering a boat, it requires two men in the boat (one at each fall, to unhook), and on board the ship, two men to lower, and two men to clear the falls —no easy matter where the falls are little used, and consequently stiff, and where, as in the case of the largest merchant-steamers, each fall is twenty-two fathoms, or 132 feet, long. Under any circumstances, it requires the greatest unanimity of action on the part of these six men; but this is not to be insured during periods of excitement and danger, and during dark nights. If one of the falls should be lowered too quickly, or if one of them should foul, or be accidentally let go, then one end of the boat having reached the water before the other, it is impossible for the men in the boat to unhook at the same time, and an accident must inevitably happen. Or, supposing that all

has gone right on board the ship, and that before the boat has reached the water, a sea should lift the stern of the boat and unhook the after-tackle, then, as in the case of the *Amazon*, the boat would sheer across the sea before the people in her could unhook the fore-tackle, and they would thereby be washed out, and the boat would remain hanging by the bow; or if, in the act of lowering, a sea should strike the bow, and unhook the fore-tackle, then the fore-end would immediately fall down, and the people would be precipitated into the sea and drowned.

There is no reason why this operation of lowering a boat should be different from any mechanical operation of the like character. We see, in the every-day operations of raising a weight, that when the weight has attained the requisite elevation, the power is disconnected, and a break, or other analogous contrivance, is substituted in order to regulate the descent. Why, therefore, should not the same plan be adopted in the case of boats which remain for a lengthened period at the requisite elevation, and which are only required on sudden emergencies? That the principle was acknowledged even by sailors themselves might be shown in the case of the anchor. After the anchor has been elevated by means of the chain to the level of the water, a tackle, called the "cat," is used to raise it to the level of the deck. This is the power; and sailors know very well that if they were to allow the same to remain, the anchor could never be used on sudden emergencies: they therefore substitute a single rope (called the "cathead stopper"), and remove the tackle. They remove the one tackle from the anchor; why therefore should they not remove the two tackles from the boats, which, it has been shown, in their use require the greatest unanimity of action?

In Mr. Lacon's method of lowering a boat this is proposed to be effected by a long bar, or rod of iron, with a barrel at either end, of a sufficient size to carry the requisite length of rope or chain, with a friction pulley and break in the centre. The ropes, or chains, are connected to the barrels in such a manner that they will support any amount of weight till the boat has reached the water, when they will unship, and disconnect by their own weight; by which means he prevents the possibility of the boat being dragged forward, capsized, or swamped, by the motion of the ship. By means of the friction break he enables one man to regulate the descent of the boat, and by means of the parallel action of the two barrels he insures the boat's descending evenly upon the water.

Diagrams were exhibited, drawn to scale, of the fittings on board two of the South Eastern and Continental Company's ships, with a certificate of experiments conducted at Folkestone, on the 5th of August last, when a boat was lowered several times during the day, while steaming at the rate of twelve and a half knots, with Mr. Lacon and four men in her.

To illustrate the dangers of the present system, several extracts from the evidence of the survivors of the *Amazon* were read, with which most of our readers must be familiar, and other illustrations were taken from the cases of the *Orion* and the *Avenger*, which struck upon the Sorelli on the 20th December, 1847; the *Pegasus*, which struck upon the Goldstone Rock, near the Fern Islands, in July, 1843; the *Solway*, which sank near Corunna, at midnight, on the 7th of April, 1843; the *Conqueror*, wrecked near Boulogne, on the 13th of January, 1842; the memorable destruction of the *Kent*, by fire, in the Bay of Biscay, on the 1st of March, 1825; an incident occurring on board the *Venerable*, 74, on the 20th November, 1804, whilst fishing the anchor; and another, and melancholy one occurring on board the *Melville*, 74, off the Cape of Good Hope, 30th April, 1835. A discussion ensued on the subject of plugs for boats, arising out of the repeated occasions in which, in case of accident, the plugs have been lost, as was the case in the recent wreck of the *Victoria* steamer. Various suggestions were made for securing them, or for the use of a valve which would allow the water to escape from the inside, but would be closed by the pressure of the water underneath. Several contrivances had been patented for the purpose, all of which were to some extent good; but the fact of their being more expensive than the common plugs, kept them from general use. The proper plan was to have the ordinary plugs secured beside the hole, and where that was not done, it was from neglect. A very efficient contrivance had been invented by Captain Claxton, which entirely superseded the plug; it consisted of a small brass tap, fixed in the side of the keel, by which the water escaped from the inside when opened, and when closed entirely prevented the entrance of the sea. Some remarks were also made on the mode of lashing the oars to the boats, and a strap and buckle was suggested to supply the place of cordage, as being more easily undone in the absence of a knife in case of accident.

In answer to a question as to how long Mr. Lacon's plan had been before the public, and whether it had been tried practically,

Mr. Farley stated that it had been before the public about a year, and that it had been tried with great success. Some months ago, the *Queen of the Belgians* steamer made the trial off Folkstone in a high gale of wind. He himself was on board. It was tried first with four men, and the boat was lowered safely whilst the steamer was going at full speed. Again it was tried with two men and Mr. Lacon with equal success, notwithstanding a heavy sea was running high at the time, and the steamer was going at the rate of twelve and a half knots an hour.

A vote of thanks was passed to Mr. Lacon, and the proceedings terminated.

THE "NAGLER" PRUSSIAN MAIL STEAM-PACKET.

The Prussian government and the authorities of the Post-office department of that country having decided on accelerating the postal communication through the Prussian kingdom, an order was transmitted to this country for Mr. Elbertzhagen, the agent for the Prussian government in London, to contract for the building of a fast steamer, to be employed in conveying the mails from Stettin to Stockholm, a distance of about 440 miles. In compliance with his instructions, Mr. Elbertzhagen entered into arrangements with Mr. Mare, of Blackwall, for the construction of an iron vessel of 600 tons, to be fitted with oscillating engines of 220 collective horse-power, by John Penn and Son, and the vessel, having been built and fitted with the engines, was tried down the river last week to ascertain her speed. The *Nagler* the name given to the packet, to commemorate the name of the late Post-master-general of Prussia, left Penn's wharf, at Deptford, and on arriving at the Lower Hope, in the Sea Reach, below Gravesend, the time was taken, and she ran the measured mile in three minutes thirty-five seconds, or at the rate of 16·744 knots per hour, with the tide. On returning past the measured mile, against the tide, she accomplished the distance in five minutes twelve seconds, or at the rate of 11·538 knots per hour. On again running the measured mile with the tide, she made the distance in three minutes twenty-eight seconds, or at the rate of 17·308 knots per hour; and her last run against the tide occupied five minutes nineteen seconds, or at the rate of 11·285 knots per hour, giving an average speed on the four runs, two down and two up, of 14,320 knots per hour.

Mr. Elbertzhagen, the agent, Captain Graeven, who superintended her construction, Mr. Waterman, jun., who designed the vessel, Mr. Hartree, of the firm of John Penn and Son, the constructors of her engines, and Mr. F. P. Smith, were on board during the trial, and all were much gratified with the result. The *Nagler* is a paddle-wheel steam-vessel, drawing 8 feet 6 inches of water, and her engines, with a stroke of 4 feet 6 inches, made 33½ revolutions on the average of the four runs, the working pressure being 14 lbs. to the square inch.

M'CONNELL'S EXPRESS ENGINES.

The great capabilities of the new express-engines constructed by Mr. M'Connell, of Wolverton, for the traffic of the London and North Western Railway, has recently been shown most satisfactorily. On Tuesday week one of these engines brought an experimental train, consisting of not less than 34 carriages, loaded to 5 tons each, from Birmingham to London in 3 hours. This is considered to be the most extraordinary performance ever accomplished by a single locomotive engine, and has confirmed the expectations formed of the merits of the arrangements recently patented by Mr. M'Connell. In many parts of the journey the speed had to be much diminished in consequence of the bad state of the road, and there is no doubt, when these defects are remedied, the two hours' trip, with a train of fifteen carriages, will be carried into effect.

THE ZODIACAL LIGHT.

The following account of the recent appearance of the Zodiacal Light at Highbury, soon after sunset, on the 11th inst., and on the preceding evenings, is communicated in a letter from Mr. T. W. Burr to the Editor of the *Times*:

"Yesterday (Friday), the sky being perfectly free from clouds, the light was distinctly visible at half-past 7 o'clock. It appeared to be a long cone of nebulous luminosity, starting from the western part of the horizon, and inclined at an angle of about 45 degrees, almost exactly in the line of the ecliptic. The breadth at the base was probably nearly 30 degrees, and it extended rather more towards the north than to the south of west. The upper side was not so well defined as the lower. It appeared to terminate almost in a point very near the Pleiades, which were then 3 hours past the meridian. The principal stars of Aries (α, β, and γ) were immersed in the light, and Saturn was immediately below the under side. The amount of light ap-

peared equal or perhaps rather superior to that of the portion of the milky way visible, and the contrast afforded by its presence between the western and eastern portions of the heavens was very decided. Towards the base the light became very diffused and the outline ill-defined. At half-past eight o'clock it was still visible, but much fainter, and could not be traced beyond Saturn."

Passage of the "Bengal" to Gibraltar.—The Peninsular and Oriental Steam Navigation Company's screw steamer *Bengal*, with the outward India and China mails, arrived at Gibraltar on the 24th ult., in 4 days 5 hours from Southampton, the quickest run out to the Rock ever made by any steamer. The *Bengal* had very fine and favourable weather, and her performances have realized the most sanguine expectations. Under canvas she went 12 knots; and under steam alone, with a heavy swell in the bay, she ran in 24 hours 264 miles, equal to 11 knots. With canvas set she ran 290 miles. The distance to Gibraltar is 1,150 miles, which was performed in 101 hours. The quickest voyages previously performed were by the *Ganges* in 108, and by the *Bentinck* in 112 hours—the latter a full-power paddle-wheel steamer.

Engineering in the Royal Navy.—A correspondent of a Mining paper says that some time since the Admiralty were so alarmed at the attacks from the public press at the deficiency of skill displayed in the steam engineering department of the Royal Navy, that they offered the engineering chief of one of the private Steam-packet Companies a salary of 2,000*l.* a year to enter into the service of the Government. The offer was declined.

THE CRYSTAL PALACE COMPANY'S BILL.

The Committee upon the Crystal Palace Company's Bill met in Committee-room No. 1, on Tuesday; Lord Barrington in the chair. The other members were Earl Mulgrave, Mr. Wyvill, Mr. Stephenson, Mr. J. G. Smythe (local members), Sir J. Duke, Sir E. Filmer, and Mr. Alcock.

The Committee-room was rather crowded by the parties interested. The petitioners against the Bill were the churchwardens and overseers of the parish of Beckenham; and the churchwardens, overseers, and surveyors of highways, and other inhabitants of Penge.

The case on behalf of the promoters of the Bill was laid before the Committee. Its object was that of purchasing the building of the Great Exhibition of 1851, in Hyde-park, and the construction of it, or of any addition thereto, on another site; and also the forming and maintaining conservatories, parks, and museums, for the illustration and advancement of the arts and manufactures. In pursuance of these objects, the Company had subscribed the sum of 400,000*l.* and upwards, and had either purchased, or contracted to purchase, an estate in Kent and Surrey, near Sydenham. They were re-erecting the building upon it, with vast additions, and were laying out considerable portions of land in gardens and pleasure-grounds. The estate was intersected by two roads, one a bridle-way, called Thicket's-lane, in bad repair and little used, and the other, part of a public carriage-road, called the Penge-road, leading from Penge to Dulwich, steep and inconvenient; and both interfering materially with the designs of the Company for their gardens and pleasure-grounds. The Company were willing, at their own expense, to make and to dedicate to the public better and more commodious roads than the existing roads, upon power being granted to them to stop up the existing roads, and to purchase Dulwich-wood.

Sir J. Paxton, Mr. Campbell, and Mr. Francis Fuller having been examined upon the details of the undertaking,

The Committee declared the preamble of the Bill proved, striking out the proposed rating clauses.

The Company's Bill has now passed the House of Commons, and at the extraordinary general meeting held at the London Tavern on Thursday last, the arrangement entered into with the West-end of London and Crystal Palace Railway Company, for their conveyance of passengers from Battersea to the Palace, was confirmed. By this arrangement, the Crystal Palace Company fix the rate at which tickets shall be issued, including the charge of transit by railway, and that of admission, of which they take four-sevenths, leaving three-sevenths for the Railway Company; the latter being guaranteed by the former at least 8d. for each passenger.

CAPTAIN NORTON'S HOLLOW EXPANDING ELONGATED SHOT.

Captain Norton has successfully tested his hollow expanding elongated iron shot. The last Number of the *Practical Mechanics' Journal* gives the following account of the nature and results of the invention:—This shot contains its own charge, which, in this experiment, consisted of two drachms and a half of Hall's gunpowder. The base of the shot was covered with a piece of thin

calico, well greased. The bore of the small cannon used was that of the military musket, and the shot weighed nearly two ounces, being an inch and three-quarters in length. After being fired, the shot could not be made to re-enter the cannon, even without the piece of calico; thus fully establishing the fact that hollow malleable iron shot will expand by the explosion of the cartridge within it. The percussion appliance consisted of a tube of steel, like that of a steel pen, the third of an inch in length, and having a military percussion-cap, without the leaf, fitted on one end; this was filled with gunpowder, and covered with thin gutta percha. It was inserted in the centre of the base of the cannon, and ignited when struck with a mallet, the fire perforating the calico, which was stretched over the hollow base of the shot, like a drum-head. Captain Norton's improvements are now beginning to command attention in the high quarters of the State. A similar hollow iron shot cast of malleable iron, such as Mr. Omanney's patent, and having projections on it to fit easily into the grooves of a rifle cannon, would not injure the grooves, as the comparatively thin sides of the hollow base would, by expanding, fit closely all round, without over-pressure on the bore of the cannon. Rifle hollow iron shot on this construction fired from rifle-cannon, would attain a range not yet reached by any description of projectile.

The Government School of Practical Art.—In order that the instruction which the public were deriving from the inspection of the Queen's porcelain at Marlborough-house might not be interrupted, Her Majesty has been graciously pleased to permit a second series of specimens to be made from the collections at Buckingham Palace, and exhibited at Marlborough-house. This series is more numerous and varied, and in some respects even finer than that recently removed. In consists chiefly of old Indian, of the highest order, and of an extensive series of Sèvres, illustrating the styles of different epochs of that Royal manufactory. Among them will be found a curious *déjeûner* service, produced immediately after Napoleon's expedition to Egypt, in which the fitness of porcelain decoration is altogether sacrificed to an affectation of forms and ornaments belonging to the age of the Pharaohs; also, some very fine jewelled cups, and a superb bowl of hard porcelain, which was executed expressly for Louis Seize. Lord Feversham has also sent to Marlborough-house some of his turquoise Sèvres porcelain for public exhibition.—*Times.*

THE CALORIC SHIP "ERICSSON."

The following account of the last run of the *Ericsson* appears in the *New York Herald*, in a letter from its Washington Correspondent, under date Washington, February 22nd:

The caloric ship *Ericsson* arrived at Alexandria (near Washington) yesterday afternoon from the mouth of the Potomac, where she had lain at anchor for 27 hours, during the late snow-storm and thick weather. Captain Lowber weighed anchor at half-past 9 o'clock last Wednesday morning at Sandy Hook, and, in pursuance of instructions, stood to the eastward, in the face of a strong gale and heavy sea. He kept his course for eighty miles, when the wind shifted to the north-west; he then stood inshore again, in the face of the gale. During these two gales the ship stood the test nobly; and though she pitched her bowsprit under water, with her leeguard immersed, her engines performed with the utmost regularity, the wheels making 6½ turns per minute with entire uniformity. Not the slightest motion was perceptible in the framework and bracing of the engines. After the ship and the engines were thus fully tested, Captain Lowber shaped his course for the Chesapeake, and, in going up the bay against a gale from the N.N.E., encountered a heavy snow-storm. On approaching the mouth of the Potomac, the weather became so thick that the pilot declined to go further, and the ship came to anchor at 10 o'clock on Saturday morning. The engine had then been in operation for 73 hours without being stopped for a moment or requiring the slightest adjustment, only one fireman having been on duty at a time during the whole trip. The consumption of fuel was under 5 tons in the 24 hours. Captain Sands, of the United States' navy, who was on board to witness the performance, is delighted with the result, and says that he would willingly go to Australia in her. Thus the great principle of the new *motor* is now a demonstrated reality.

[The results of this trip appears to have inspired new confidence on the other side of the Atlantic in the efficiency of the caloric principle; and we find by the news brought by last Monday's American mail, that it has received attention in Congress. The Secretary of the American Navy had addressed a letter to the Naval Committee of the House of Representatives, recommending the passing of a resolution by Congress authorising the department to contract for the building of a frigate of not less than 2,000 tons, to be equipped with caloric en-

gines of sufficient power. He asked for an appropriation of 500,000 dollars to commence the work, stating that he was convinced the experiment would result in introducing the caloric-engine into the naval service.]

The following is an extract from a private letter which we have received from a correspondent at New York:

"I am quite surprised to see what a furor the above matter has created in Europe. Here, as a motive power *afloat*, all hands consider it a flat failure. Notwithstanding the great caution used to keep engineers out, none even yet being allowed on board, enough has transpired to enable our skilful ones to cypher on the matter. On the point of safety, some contend it is worse than steam. May not cylinders of cast-iron, 15 to 20 feet diameter, occasionally *burst* under a pressure 8 or 10 lbs. to the inch? And if so, which is preferable, to be scalded by steam at 220°, or frizzled by air at 480°? The Company announce that they have orders for 425 engines on this plan, and yet have tried to cajole the Government into a contract for two vessels! this, after stating that they were not prepared to take orders yet. Finally, as to this being a new invention, it is only necessary to take your Magazine for authority to show it was invented and put in full practice years ago by Dr. Stirling, of Scotland. So completely had the Doctor anticipated Mr. E——, that he was headed off on almost all points on his application for a patent at our office, and had to fall back upon his peculiar modifications."

The Principles of Mechanical Philosophy Applied to Industrial Mechanics. By THOMAS TATE, F.R.A.S. Longman and Co.

THE name of Mr. Tate is too widely and too favourably known in the philosophical world, for the extremely valuable aid he has rendered in the cultivation of the exact sciences, to require any introductory or commendatory observations from us. We have before us another, and, we are certain, a very acceptable contribution, which he has offered to the means already provided by our literature for acquiring a substantial knowledge of the science of forces and motion. It must be confessed that, considering the wonderful perfection which the art of machine-making has attained in this country, the mathematical principles upon which their effective operation depends, and which should as far as possible determine the relative dimensions, weights, and forms of the several parts, are very far from being so generally understood as is desirable. That this is the case to a greater extent than would be supposed by those who are accustomed to look only at the amount of work done as compared with that accomplished by hand-labour, without considering whether a machine is in a condition of maximum mechanical efficiency, may be readily inferred from the number of examples which meet the eye from time to time, in which some elementary principle of construction has been violated, or in which a given force is applied at considerable disadvantage. This opinion is amply sustained by that of Professor Moseley, in his report on the hydraulic machines in the Great Exhibition, which the author adverts to in his preface.

Proceeding upon this basis, therefore, the author of the present volume has put into the hands of machinists, engineers, and all whose occupation requires the application of power in mechanical arrangements, a development of the great principles of statics and of dynamics, to a great extent novel, and certainly more suited to men of those classes, who have little time and perhaps less inclination for more elaborate study than our university class-books, which are generally the type of all others.

Referring the solution of all questions to an equation between "units of work done," the subject is rendered more intelligible to practical men than would probably be the case if the same thing were attempted upon principles which to them would appear less inartificial. It must not be supposed, however, that it is to such men only that this work recommends itself. They will acquire undoubtedly a substantial and intelligent insight into these principles, and understand their application in practice, which to them is of great importance. Those who have had the advantage of studying the works of Whewell, Earnshaw, Venturoli, Wood, and others, will find a large collection of mechanical problems having important bearings in the concerns of life, elegantly treated, and well worthy of attention. The plan of the work is very extensive, embracing the subjects of hydrostatics and hydraulics, and investigations on the expansion of elastic fluids, with reference chiefly to the working of the steam engine. The formulæ given have been collected from a wide surface of the highest order of mathematical literature, and in some few instances they have been supplied by the author himself. We may mention particularly those which relate to the flow of water in pipes, and the work of steam. A subject of great importance to the success

of the author's purpose is the new law which he enunciates and demonstrates in the last article of the book, relative to the conditions of the maximum work of steam. These and a number of other features in Mr. Tate's excellent book, which mechanical and mathematical readers will know well how to appreciate, confer upon it a high practical value, and add much to the already eminent services which its author has rendered to the promotion of science.

The Practical Draughtsman's Book of Industrial Design. By WILLIAM JOHNSON, A.I.C.E. Longman and Co.

THE course of studies in geometrical, mechanical, and architectural drawings described by us in a recent Number, as forming the plan of "The Practical Draughtsman's Book of Industrial Design," is ably continued in the Second Part, which has now been published. A large collection of examples in the conic sections, with their combinations and application in the arts, has been judiciously selected, their geometrical properties concisely stated and clearly exhibited, wherever they possess an important practical bearing, and the best modes of constructing the curves in practice fully described. This part of the subject includes an account of the instruments expressly invented for this purpose, and a full explanation of their use. Some examples are given also of ovals of more than two foci, and particularly the oval of five centres, and its application to the figure of the intrados of an arch. The construction of the Ionic volute, the method of drawing tangents to curves, and that of connecting straight lines by curves to which the given lines shall be tangents, is included in this part of the subject, together with some incidental geometrical operations of minor note. Then follow a great number of rules, formulæ and tables, having reference to regular figures, some of which will be found to facilitate very much some of the operations of the draughtsman. There is also a copious table on measures of lengths in all countries, exhibiting their value in French millimetres, and in English feet. The study of the projection of points, lines, surfaces, geometrical and architectural solids, and shadows, is very successfully treated, and, with the aid of numerous figures, made clear to ordinary intellects. Some examples of the projection of grooved cylinders, and of ratchet wheels, with a full explanation of the methods of proceeding, are included in this portion of the subject. The rest of the part is devoted to the study of architecture, considered with reference to elementary forms of all kinds. Altogether, the original design of the work is well carried out in this part, which gives promise of its great value when completed.

The Conical Flour Mill.—We have been informed that the conical and ordinary mills of Messrs. Pavitt are visited daily by persons of eminence, wishing to erect mills on their estates, or to obtain an interest in the patent.; among others, Lord Viscount Hill, the Duke of Marlborough, Mr. Jay (the contractor for the Palaces of Parliament), and some very extensive Manchester millers, have visited, or sent their agents, during the last week; and that bakers are issuing orders to such an extent for the flour by the conical system, that, though the mill is working night and day, it is impossible to execute them in full. We have been further informed that the Right Hon. R. A. Christopher, M.P., has taken charge of the Parliamentary proceedings in the Commons, in which he will be cordially supported by Sir John V. Shelley, Bart., and other influential members. Patents are taken out in every country in which they can be granted, and applications are daily made from the Continent and the United States to have mills. Besides those already erected in France, Belgium, Vienna, and Mexico, others will speedily be erected for the Hanse Towns, Russia, Denmark, Sweden, and Switzerland. Altogether, such a movement is making in favour of this invention as has never been known in favour of any other discovery since the times of Arkwright, James Watt, and the first Sir Robert Peel. It is a remarkable feature in the formation of this Company, that it is not to go on the Stock Exchange, but to be carried out by private capitalists, under a Royal Charter, and that no share less than 1,000*l.* is to be issued, and no deposit less than 100*l.* received.—*Mark-lane Express.*

SUSPENSION BRIDGE OVER THE ST. LAWRENCE.

WE have received a copy of "a report on a Railway Suspension-bridge over the River St. Lawrence, near Quebec, made for the city council, by order of N. F. Belleau, Esq., mayor of Quebec, by William Serrell, C. E." The report reflects the highest credit on Mr. Serrell. It has been most carefully prepared. Three sites for the proposed bridge were surveyed; one near

the river Chaudiere, about four miles from the mouth of Cape Rouge Creek, another from Durham Terrace to Point Levy, and a third from a few hundred yards above Cape Diamond to the opposite shore. The result of which surveys or examinations is, that Mr. Serrell sees the entire practicability of a bridge for railway and other travel, and "that too within the means at your (the City Council's) command." The site selected near the Chaudiere will require a bridge of 3,400 feet. The plan proposed is a wire suspension-bridge, consisting of two massive towers of masonry, built in the river in 12 feet deep of water at average low tide; these towers to be in total height from their base about 330 feet, and 52 by 187 feet square at the base, battering regularly upwards, and they will be 1,610 feet apart at their centre. The height of the roadway above high water is to be 162 feet; the roadway will consist of two carriage-ways, each 10½ feet wide in the clear, and a railway-track of such width or gauge as to match the railways which may connect with it; the entire width of the road being 32 feet in the clear inside the parapet.—*Montreal Herald.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MARCH 14, 1853.

Charles Cowper,* of Southampton-buildings, Chancery-lane. *For improvements in the application of iron to building purposes.* (A communication.) Patent dated August 26, 1852.

Claims.—1. The manufacture of rolled wrought iron beams for building purposes, with two or more bearing surfaces on their bottom flanges, and the application of the same to the construction of floors, roofs, bridges, and similar structures.

2. The manufacture of rolled wrought iron joists of certain sectional forms shown, and the application of the same to building purposes.

3. A mode or modes of constructing hollow wrought-iron beams or breastsummers, and doorposts and columns.

4. The manufacture of rolled wrought-iron bars of certain sectional forms shown, and the application of the same in combination with other bars to the construction of window-frames and cases.

William Henry James, of Great Charlotte-street, Surrey, civil engineer. *For improvements in heating and refrigerating, and in apparatus connected therewith.* Patent dated September 3, 1852.

These improvements consist,

1. In a method or methods of transmitting heat from its source or sources, which may consist of furnaces containing inflammable matters in a state of combustion, or of heated vessels or materials, to any other apparatus or materials to which it is required to be applied, and which may be situated at any given distance, by means of hot air or other elastic fluids or vapours, jointly or singly made to pass or circulate through endless tubes or passages extending through, around, or in contact with the source or sources of heat; and also through, around, or in contact with the apparatus or materials to be heated.

2. In a similar method or methods of transmitting and circulating air through endless tubes or passages, passing through or in contact with vessels containing or surrounded by ice or other refrigerating materials, for the purpose of refrigerating materials, or vessels in or connected with such circuit, or exposed to the action of the air so refrigerated and circulated.

3. In the use of coal-tar, or other inflammable materials as fuel for generating steam in marine and locomotive boilers or generators; the tar being supplied from reservoirs, and inflamed in conjunction with other inflammable matters in furnaces placed separate from such boilers or generators; and the gases, flames, and vapours being conveyed from such furnaces through tubular openings or passages leading to the boilers or generators, there being extra chimneys with dampers, whereby the heat can at any time be diverted and cut off from the boilers or generators.

4. In the application of steam surcharged with caloric to the generation of ordinary steam, and also to the heating of cellular, tubular, vesicular, or other shaped hollow plates and vessels, when used for heating and for the construction of ovens and cooking apparatus, or for other heating purposes.

5. In surcharging with caloric the exit steam (or a portion thereof) from steam engines, and then employing such surcharged exit steam in the generation of ordinary steam to assist more or less in the working of the engines.

6. In surcharging with caloric the exit steam in double cylinder or double-action

[* This specification was erroneously reported in our last Number as being "due, but not enrolled;" whereas it appears, by reference to the books of the Inrolment-office, that it was enrolled on the 24th January last. The error arose from information supplied to us at the Inrolment-office, and we now take the earliest opportunity of correcting it, regretting at the same time that it should ever have occurred.—Ed. M. M.]

expansion engines, and then employing the exit steam so surcharged with caloric in generating fresh steam to assist in the working of the engines.

7. In surcharging with caloric the exit steam arising from covered evaporating pans or vessels, and employing such surcharged steam in mainly reheating the same.

8. In surcharging with caloric the exit air and vapours from drying-rooms, manufactories, or other buildings artificially heated, and then employing such air and vapours so surcharged with caloric for heating the fresh atmospheric air entering or previous to entering such drying-rooms, manufactories, and other buildings, and also for heating the fresh air previous to entering the furnace and fire where the heat is generated.

9. In a mode of regulating the temperature, pressure, and quantity of surcharged steam for any requisite purposes, by means of an equivalent compensating column or head of water.

10. In refrigerating during the heat of summer, and particularly in tropical climates, by means of cold air conveyed from elevated or other cold localities, through tunnels or passages placed generally underground by means of fan-wheels, pumps, or other suitable exhausting and propelling machinery worked by water or other cheap power.

11. In producing the refrigeration of materials in vessels, or of the vessels themselves, for refrigerating other materials by the expansion of atmospheric air therein from its ordinary pressure and temperature.

12. In refrigerating and condensing or partially condensing the steam from steaming-rooms or other steam apparatus, or the vapours from stills or evaporating vessels, by the joint action of the cold water or other fluid used and the cold air passing for the supply of the fire.

Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury. *For improvements in producing gas, and in its application to heat "and light."* (A communication.) Patent dated September 7, 1852.

The words "and light" have been disclaimed from the title of this patent.

1. The improvements in producing gas consist of an arrangement of close furnace, wherein gas is generated by the combustion of coal or other matters capable of yielding gas; the apparatus being made of such size as to render it capable of being readily transportable.

2. The gas thus generated is applied direct to the heating of locomotive and marine steam boilers by combining the generator with the boiler and conducting the gas as produced into the furnace, where it is ignited in suitably-constructed burners, arrangements being made for the admission of air in the requisite proportions to support combustion.

Claims.—1. The construction of an apparatus for producing gas by the combustion of the combustible.

2. The mechanical arrangements for heating locomotive and other steam-engine boilers.

John James, of Leadenhall-street, London, manufacturer. *For certain improvements in weighing-machines and weighing-cranes.* Patent dated September 9, 1852.

This invention comprehends—

1. An improved construction of platform-weighing-machine, the principal novelties of which consist in bracing and supporting the platform in such manner, that a weight placed on any part of it shall be evenly distributed over its surface, and in supporting the platform, so that both ends of the steelyard may be raised simultaneously.

2. A peculiar construction of steelyard frame, in which the head of the standard, where the knife edges of the steelyard rest, is constructed so as to overhang the stem, and thus admit of bulky goods being weighed without coming in contact with the stem of the standard.

3. A compound steelyard, which may either be composed of two parallel bars, graduated and weighted for different denominations of weight, or of a single bar graduated to different scales on both its upper and under side, and provided with two weights adapted to the graduations employed.

PROVISIONAL PROTECTIONS.

Dated January 31, 1853.

243. David Stevens Brown. Improvements in barometers, part of which invention is applicable to the registry of other fluctuations than those of barometers.

258. Richard Palmer. An invention which may be used for cutting turnips, mangold-wurtzel, carrots, and other roots, or for bruising them only, or reducing them to a pulp, and for mixing them with meal as may be required, and also for grinding or crushing apples for cider.

Dated February 10, 1853.

362. Robert Roger. Improvements in obtaining motive power.

Dated February 17, 1853.

411. John Collins Browne. Improvements in the propelling of vessels.

412. William Bridges Adams. Improvements in railways.

418. Thomas Clark Ogden and William Gibson. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

Dated February 22, 1853.

451. Pierre Frederick Gougy and David Combe

Improvements in apparatus for skidding or stopping wheels of carriages and other vehicles.

453. John Richard Cochrane. Improvements in the manufacture or production of ornamental or figured fabrics.

Dated February 23, 1853.

455. John Smith. Improvements in machinery for raising and forcing water and other fluids.

457. Eduard Albrecht. Improvements in apparatus for transmitting and reflecting light.

459. Robert Milligan. Improvements in apparatus for washing slivers of wool.

461. Asa Willard. Improvements in machines for manufacturing butter, to be called "A. Willard's Butter Machine."

Dated February 24, 1853.

463. John Green. The more economic, speedy, convenient, and in every respect superior system of cooking to any now in use, and which he designates "Green's Economical Self-basting Cooking Apparatus."

464. William Spence. Improvements in machines for thrashing and winnowing corn and other agricultural produce. A communication.

465. Henry Walmsley and Thomas Critchley. Improvements in machinery or apparatus for retarding or stopping railway trains, which machinery or apparatus is also applicable as a signal or communication from one part of a train to the other.

466. Peter McLellan. Improvements in thrashing-machinery.

467. William Johnson. Improvements in the treatment or manufacture of caoutchouc. A communication.

469. Thomas De la Rue. Improvements in producing ornamental surfaces to paper and other substances.

470. Emile Adolphe Hermann. Certain improvements in machinery for manufacturing woollen cloth. A communication.

471. James Lawrence. Improvements in the drying or preparation of malt, meal, seeds, corn, and other grain.

472. Thomas Brown Jordan. Improvements in machinery for planing slate.

Dated February 25, 1853.

473. Francis Preston. Improvements in the manufacture of certain parts of machinery to be used in preparing and spinning cotton or other fibrous materials.

475. Benjamin Price. Improvements in the construction of furnaces or flues of steam boilers, coppers, and other like vessels for heating or evaporating liquids.

476. John Grist. Improvements in machinery for the manufacture of casks, barrels, and other similar vessels.

477. William Symington. Improvements in preserving milk and other fluids.

478. John Palmer de la Fons. Improvements in applying skids or drags to omnibuses.

479. Thomas Richardson. Improvements in the manufacture of certain compounds of phosphoric acid.

480. Henry Martyn Nicholls. Improvements in emission or reaction engines.

481. Antonio Fedele Cossus. Improvements in filters.

483. Frederick Goodell. An improved apparatus for the distillation of rosin oil, and for an improved method of bleaching and deodorizing the same during the process of manufacture. Partly a communication.

Dated February 26, 1853.

484. Charles Napoleon Wilcox. Improvements in the manufacture and application of certain extracts obtained from the elder-tree.

485. Jean Joseph Fréchin. Improvements in the construction of locomotive engines.

486. William Mackenzie Shaw. An improvement in the construction of locomotive boilers.

487. Joseph Brandeis. Improvements in the manufacture and refining of sugar.

488. Mark Henry Blanchard. Improvements in the manufacture of pipes of earthenware, clay, or other similar materials.

482. William Edward Newton. Improvements in machinery or apparatus applicable to wheels or axles for counting and indicating the number of rotations made thereby. A communication.

490. Ebenezer Thornton. Certain improvements in the construction and arrangements of kitchen boilers and flues for ranges.

491. The Honourable James Sinclair, commonly called Lord Berriedale. Improvements in weaving.

492. Robert Griffiths. Improvements in propelling vessels.

493. Charles Tetley. Improvements in obtaining power by steam and air.

494. Charles Tetley. Improvements in the manufacture of bobbins.

495. Samuel Varley. Improvements in making communications between the guards and engine-drivers on railway carriages.

496. Admiral the Earl of Dundonald. Improvements in producing compositions or combinations of bituminous, resinous, and gummy matters, and thereby obtaining products useful in the arts and manufactures.

Dated February 28, 1853.

498. James Murphy. Improvements in trucks, wagons, or vehicles for railway purposes.

500. Martyn John Roberts. Improvements in the manufacture of mordants or dyeing materials, which are in part applicable to the manufacture of a polishing powder.

502. George Duncan. Improvements in steam boilers.

504. Joseph Major. Improvements in preparing lotions, which he intends to call the "Synovitic Lotions."

Dated March 1, 1853.

506. Robert Stephenson, junior. Improvements in locomotive engines.

508. John Bethell. Improvements in preserving wood from decay.

512. William Rowett. Improvements in making paddle-wheels for vessels propelled by motive power, which is called "the Cylinder Paddle-Wheel."

514. John McAdams. Improvements in machinery or apparatus for printing on leaves of books their designations, numbers, or devices, or those of their pages, which machinery or apparatus may also be used to advantage for printing designating numbers or devices on various other articles.

Dated March 2, 1853.

516. Laurence Hill, junior. Improvements in the production of motive power. A communication.

518. Howard Ashton Holden, Alfred Knight, Edward Bull, and John Banfield. Certain improvements in communicating and giving signals between the engine-drivers and guards on railway trains, being in connection with a mode already patented for effecting the same object.

520. Alexis Soyer. Improvements in preparing and preserving soups, which he denominates "Soyer's Osmazome Food."

522. Edward Duke Moore. An improved mode of treating the extract of malt and hops.

524. Alfred Augustus de Reginald Hely. An improved door or finger-plate.

526. Marcel Vetillart. Improvements in drying yarns.

Dated March 3, 1853.

528. William Clark. Improvements in propelling and steering vessels, and in the apparatus used therein.

530. Simon O'Regan. Improvements in apparatus for consuming smoke.

534. Martin Billing. Certain improvements in metallic bedsteads.

536. Samuel Colt. An improved construction of blower. A communication.

538. Samuel Colt. Improvements in rotating breech fire-arms. Partly a communication.

540. William Edward Newton. Improvements in primers for fire-arms. A communication.

542. Thomas Crick. Improvements in the manufacture of boots, shoes, clogs, and slippers.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 11th, 1853.*)

284. George Simpson. Certain improvements in machinery or apparatus for weighing.

424. John Henry Johnson. Improvements in drying, and in the machinery or apparatus to be used therein. A communication.

486. Julian Boilesve. An improved mode of preserving vegetable substances and animal coatings.

412. John James Stoll. Improvements in the manufacture of boots and shoes and similar articles, and in machinery used therein, entitled "Metallic toothed and wedged seams, and waterproof elastic indented stitches"

(*From the "London Gazette," March 15th, 1853.*)

261. William Abbott. An improved plough.

313. John Egan. A self-acting flax-scutching and hackling machine, with horizontal blades or hackles, an inclined plane on which flax-holders move the application of the fan by a current of air to press flax against schutching-blades or hackles, and spring catch flax-holders, as per drawing.

332. George Searley. Improvements in machinery for cutting, carving, and engraving wood, stone, metal, and other suitable materials.

366. Joseph Nash. The treatment and refining of sugar.

381. Thomas Brown and John Cox. Certain improvements in the mode of heating retorts or ovens for the manufacture of coke, gas, and other distillatory products of coal.

421. Charles Reeves, junior. An improvement or improvements in the manufacture of knives.

444. Gabriel Benda. Improvements in apparatus for obtaining fire for smokers.

461. Thomas Henry Biddles and John William Douphrate. Improvements in machinery for the manufacture of textile and looped fabrics.

520. Claude Mamés Augustin Marion. A new kind of damper for moistening stamps and paper.

551. Henry Provost. An improved hat-protector.

730. George Philcox. Improvements in marine chronometers and other time-keepers.

743. Peter Forbes. Improvements in sowing or depositing seeds in the earth.

949. John Bethell. Improvements in machinery or apparatus for digging and cultivating land.

1049. Charles Edmond Magnant. Certain improvements in tanning.

1085. James Dunlop. Improvements in saddles.

1127. John Roydes. Improvements in machinery or apparatus for drawing cotton and other fibrous substances.

1146. Nicolas Malinau. Improvements in stopping or covering bottles, decanters, pots, and other receptacles of glass, porcelain, and earthenware, and in the machinery connected therewith.

1172. John Mason. Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.

147. William Williams. Improvements in refrigerating apparatus.

161. Louis Jules Joseph Malegue. A certain colouring composition for dyeing tissues, or stuffs of silk and cotton.

180. John Stevenson. Improvements in machinery for spinning flax and tow

243. David Stephens Brown. Improvements in barometers, part of which invention is applicable to the registry of other fluctuations than those of barometers.

253. John Mason. Improvements in looms for weaving.

388. John Bethell. Improvements in obtaining copper and zinc from their ores. A communication.

416. Charles Gordon. An improved goniometric protractor, or instrument for setting out and measuring angles and other geometric figures.

429. Nathan Dutton. Improvements in the manufacture and application of dowels and machinery connected therewith, parts of which machinery are applicable to other purposes.

437. Wright Jones. Improvements applicable to steam pipes used for warming, drying, or ventilating.

438. Samuel Rodgers Samuels and Robert Sands. Improvements in looms for weaving.

446. Benjamin Barton. An improved bath which can also be used as a life-boat.

458. Reuben Plant. Improvements in safety-lamps.

459. Robert Milligan. Improvements in apparatus for washing slivers of wool.

460. Samuel Cunliffe Lister. Improvements in treating soapsuds.

462. Adam Cyrus Engert. Improvements in joints for the sticks of parasols, and other like purposes. A communication from Alexander Porecky.

464. William Spence. Certain improvements in machines for thrashing and winnowing corn and other agricultural produce. A communication.

469. Thomas De la Rue. Improvements in producing ornamental surfaces to paper and other substances.

471. James Lawrence. Improvements in the drying or preparation of malt, meal, seeds, corn, and other grain.

477. William Symington. Improvements in preserving milk and other fluids.

483. Frederick Goodell. An improved apparatus for the distillation of rosin oil, and for an improved method of bleaching and deodorizing the same during the process of manufacture. Partly a communication.

487. Joseph Brandeis. Improvements in the manufacture and refining of sugar.

490. Ebenezer Thornton. Certain improvements in the construction and arrangement of kitchen boilers and flues for ranges.

493. Charles Tetley. Improvements in obtaining power by steam and air.

494. Charles Tetley. Improvements in the manufacture of bobbins.

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paddle-wheels for vessels propelled by motive power, which is called "The Cylinder Paddle-wheel."

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542. Thomas Crick. Improvements in the manufacture of boots, shoes, clogs, and slippers.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

577. John Hall and John Crofts. An improvement or improvements in revolving or repeating fire-arms. March 7.

WEEKLY LIST OF PATENTS..

Sealed March 12, 1853.

251. Auguste Edouard Loradoux Bellford.
287. Auguste Edouard Loradoux Bellford.
301. Samuel Smith.
575. Pierre Bernardet de Lucenay.
982. Peter Armand Lecomte de Fontainemoreau.

Sealed March 16, 1853.

53. Thomas Brown Dalziel.
56. John Finlay.
64. Henry Richardson Fanshawe.
101. Thomas Allan.
106. Thomas Allan.
181. William Edward Newton.
207. William Donald Napier and William Lund.
219. Arthur Richard Burr.
231. George Walker Nicholson.
234. John Balmforth, William Balmforth, and Thomas Balmforth.
235. Adam and John Booth.
259. George Walker Nicholson.
260. William Coles Fuller and George Morris Knevitt.
262. Robert Mortimer Glover and John Cail.
286. Auguste Edouard Loradoux Bellford.
305. John Talbot Tyler.
321. Samuel Hardacre.
322. George Gent and Samuel Smith.
341. Edward Simons.
347. Auguste Edouard Loradoux Bellford.
354. Joseph Walker.
356. Joseph Robinson.
515. Robert William Mitcheson.
529. Robert William Mitcheson.
538. Alfred Charles Hervier.
543. John Norton.
615. Charles Dickson Archibald.
739. Amory Hawkesworth.
1120. Jean Baptiste Moinier and Charles Constant Boutigny.
1182. James Webster.
64. Michael Fitch.
74. Thomas Cottrill.
92. William Brown.
94. William Wills Wren.
103. James Stewart Kincaid.
108. Peter Alexander Halkett.
117. Henry Henson Henson and William Frederick Henson.
125. Peter Fairbairn and Samuel Kenny Mathers.
129. William Vincent.
131. Joseph Rock Cooper.
144. William Riddle.
153. James Middlemass.
160. John Chubb and John Goater.
177. Charles Randolph and John Elder.
188. John Sangster.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

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Mechanics' Magazine.

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CHAPIN'S PATENT DUPLICATE PROFILE-TURNING MACHINERY.

CHAPIN'S PATENT DUPLICATE PROFILE-TURNING MACHINERY.

(American patent dated January 11, 1853.)

The accompanying figure represents a lathe and machinery for turning duplicate profile work, especially applicable to decorative purposes, the invention of Mr. Nathan Chapin, of New York. The *Scientific American* gives an account of this contrivance, from which we extract the following:

The work produced is waved work, and it is adopted for various ornamental purposes, particularly chairs, blinds, &c. The machine consists chiefly of a revolving cylinder, formed by the pieces of wood to be operated upon, a tool and pattern-frame in front of it for turning the outside of the wood, and a tool for acting upon the inside of the wood in the cylinder, through the shaft, to turn both surfaces of the wood according to the desired patterns. In the figure, one-half of the wood which would comprise the cylinder is removed in order to show the tool which works inside.

A is a stationary shaft. On it are placed the double rings, or open discs B B′, which have centre-collars fitted upon a shaft, so as to make them revolve on the shaft. C is the driving pulley, secured to a collar of the discs, which it turns on the stationary shaft, A. All the pieces of wood to be turned are placed between the two open-end discs, B B′ like the staves of a barrel, and clamped up by screws, *h*, which draw the section rings, *e e*, close to the outer ring of the discs, and bind the pieces or slats of wood between them. When the two discs are fitted with the pieces of wood forming the cylinder, they are made to revolve by the pulley C. To turn the faces of the wood the desired pattern, a tool for that purpose is made to act on the face of the wood by means of a guide-pattern; *n*, is the stationary pattern on the outside frame in front of the rotating discs; K K are the arms of the tool or gouge L. This tool is hung, as it were, in a knuckle-stirrup, and the upper part K K, is made to slide along the track forming the bar of the upper part of the frame. The screw, O, in the guide, is like that of a pentagraph. It runs along the pattern, *n*, as K K are moved along the frame by hand; and thus the pattern guides the tool, L, in and out, over its inequalities, so as to produce on the pieces of wood surfaces the reverse of the pattern. This is the way the outside surfaces of the slats are produced.

The inside surfaces are acted upon and produced as follows:—In the lower part of the shaft, A, there is a rod, D, extending the whole length along it in a recess formed for the purpose. This rod carries an arm, I, on its inner end, which carries the gouge, J, for acting on the inside. The rod, D, on its outer end, has a guide, E, which lies on the surface of the pattern, *a*. An attendant draws the guide, E, along the slide, *b*, and the pattern, *a*, so directs it by its inequalities, as to vibrate the rod, D, and consequently the arm, I, and the gouge, J, so as to act upon the wood inside, and thus turn both surfaces at the same time. The tool for the outside is drawn along from left to right, and from end to end of the wood, and the tool, L, by the rod, D, is drawn along at the same time. Thus both inside and outside of the wood forming the cylinder are turned at one operation, as the open discs carrying the pieces of wood are driven round. The discs are from 6 to 8 feet in diameter. and a man can enter through the open spaces to trim off any deficiencies inside. A saddle, G, for this purpose is hung on the shaft supported by arms, *f f f f*.

This machine does a great quantity of such work very rapidly, and produces it in a completely finished state. It is now working successfully at New York, and its operation is represented as being in every way satisfactory.

ON THE CAUSES OF FIRES IN STEAM SHIPS.

Amongst the numerous sources of danger from fire on board ship which Professor Graham has brought to view in his able Report (*Mechanics' Magazine*, No. 1515) is that of the ready inflammability of bulkheads, formed as they are of wood, in coal-holds, and more especially of such bulkheads as are in the vicinity of the boiler in steamers. To diminish this danger, he proposes that the wood should be impregnated with some saline solution, and also that such bulkheads should be double ones, having a stratum of air between the two partitions. The Professor's suggestions on this subject led to a reference to the *Mechanics' Magazine* of the 7th October, 1848, as the double bulkheads and double ships' sides therein described, from the notes of Sir Samuel Bentham, seemed to answer the purpose Professor Graham had in view; while, at the same time, this mode of construction would enable increased strength to

be given to a vessel, with a lesser expenditure of materials—as has, indeed, been since proved in a structure of a different kind, the Britannia Bridge, where vast strength is given by a cellular disposition of the material. The part the note of the above distinguished officer which relates to the subject at present in question is as follows:—"The sides of a ship, and the bulkheads themselves, should be composed of a kind of cisterns, of perhaps three feet fore and aft, by as much athwart ship, so as to admit of a man passing freely into them (or say but two feet); that is, the sides and bulkheads should be double, with space enough for a man to enter within them. All these cisterns would then be used for water, or for dry provisions, or for other articles of store."

It would seem that this mode of construction is particularly desirable for all parts of vessels containing inflammable stores, as also to those particularly liable to ignition from their vicinity to the engine-fire or other centres of great heat; the cisterns being filled with water, would never rise to a greater heat than that of boiling water. Thus the sides and the bulkheads of coal-holds might be of cast-iron cisterns, without loss of stowage-room, if used as tanks containing a supply of fresh water. Even the deck above these coal-holds might be of the same material, double, having a stratum of water between the upper and lower parts. In like manner such water-tanks might prevent the transmission of great heat wherever their weight would not be objectionable.

A thin stratum of water, were it but of half an inch, would evidently be a better security against the transmission of heat exceeding 212° than air could be; so that where heavy or thick partitions would be inadmissible they might be formed of wood, double, leaving a vacancy for water between the two; the wood sheathed with some metal or matter not capable of decomposition by hot water. The tanks of the *Dart* and the *Arrow* were sheathed with tinned copper. Or the partitions might be of metal only, though thin and light, were it either corrugated for strength, or in any way sufficiently supported. Water in small quantity would soon rise to the boiling point when exposed to great heat; provision, therefore, would have to be made for the escape of steam, and even for what might fly off in the form of vapour; and also self-acting means for the renewal of the supply of water, so as to keep the partitions always full. In many cases, water already heated in the partitions might be made to supply the engine-boiler. At any rate, water passing for this purpose through the partitions would keep them comfortably cool.

Professor Graham says in his report, "But the circumstance which appears above all others to give a character to the fire in the *Amazon* was its occurrence, not in close hold or cabin, but in a compartment of the vessel where a vigorous circulation of air is maintained by the action of the boiler-fires and their chimneys. The air of the engine-room must be renewed under this influence every few minutes." It would seem that the mischievous current of air through the engine-room thus caused might be very easily prevented. Nothing more seems necessary than that air should be conveyed to the fire through a pipe opening without the ship's side, and having no connection with any other part of the engine-room than the fireplace itself. By such an arrangement, the air of the engine-room would not necessarily be changed, however great the action of the chimneys; and the further advantage would be gained of a power of regulating easily the volume of air admitted to the fire by means of regulators in the air-pipe. It would be expedient that the air-pipe should pass through both sides of the vessel, in order that air might be admitted from the most favourable side, the opposite aperture being closed. It is from disregard of this precaution that so many failures have occurred in the ventilation of houses by the admission of external air to fireplaces.

GEOLOGY OF "THE DIGGINGS."

(From the *Liverpool Mercury*.)

Among the passengers by the *Falcon*, which arrived in the Mersey on Tuesday from Sydney, was Mr. John Calvert, a geologist, who has been eleven years in the Australian Colonies. During that time he has made a geological survey of all the mineral districts in Adelaide, Van Diemen's Land, Sydney, and New Zealand, and he has brought back with him a map of the western Gold-fields which alone is 30 feet long. He has also a large number of drawings, some of them valuable in a scientific point of view, and others pleasing and instructive, as giving a sketch of life and manners at the gold diggings. Mr. Calvert has himself been engaged for eight years in tracing the auriferous veins, and in procuring gold. A short time ago he sent home a block of quartz weighing a ton and a half, and he has brought with him in the *Falcon* 730 nuggets of the precious metal. One of the pieces weighs 23lb. of pure gold, and we had the opportunity of seeing a piece weighing 1¼lb., which is considered one of

the best specimens, being, in the state in which it was discovered, above the standard. The amount of gold brought home by Mr. Calvert is about 330lb. gross, between 70lb. and 80lb. being dross or quartz more or less mixed with the gold. The largest quantity he ever obtained in one day was 76lb. weight, which he broke off with his geological hammer in pieces varying from half an ounce to 2lb. weight. He had been led to the spot by auriferous indications, increasing as he came nearer, for a distance of nearly 40 miles. The quartz vein ran north and south, and was from about 9 to 15 feet in breadth, half a mile from where he robbed it of its precious treasure. It stands out in large blocks of from 15 to 20 feet in height, looking in the distance like white houses. This place is distant from Sydney about 215 miles, and a long way from any at present worked gold field. During the latter part of his residence in Australia, Mr. Calvert had a camp, and three men as assistants, and, properly equipped, he pursued his scientific survey. Among his discoveries he found diamonds, rubies, and many valuable minerals, in which the Australian colonies abound. We understand that Mr. Calvert will proceed direct to London, where he intends to get his drawings and maps transferred to canvass, for the purpose of exhibiting them as a panorama of the gold-fields, illustrative of lectures which he intends to deliver on the origin of gold, and on the colonies towards which so many thousands of his fellow-countrymen are now turning their attention.

ENGINEERING ON THE OHIO.

(From the *Scientific American*.)

The introduction of railways has produced many astonishing changes in the course and channels of our internal trade, and not least among these changes is that which is just being shadowed forth by the completion of the several lines of railroad in the states of Virginia, Pennsylvania, New York, and Ohio, through the various points on the Ohio river. What this change is to be is already indicated by the delivery, on the sea-board, of cotton, pork, and other western produce, by way of the Baltimore and Ohio Railroad, now completed to Wheeling. The advantages which must accrue by thus delivering produce in the sea-board markets in from ten to twenty days, instead of as formerly by way of New Orleans in about three months, are too evident to be overlooked. Some enterprising gentlemen, engaged in the western trade, have investigated this subject thoroughly, and are satisfied that the present means for passing steamboats around the Falls of the Ohio, by the Portland Canal will soon become entirely inadequate to the increased commerce of the Ohio, which must result from these new outlets. With these views they have projected the following novel plan for passing steam-boats of the largest class around these falls.

It may be premised, that the only present mode of passing boats in times of low water is by the Portland Canal, on the Kentucky side of the river. This canal can only pass boats, the dimensions of which do not exceed 180 feet in length, and 48 feet beam over the guards, consequently the business must then be carried on by boats within these dimensions. The project above mentioned is simply to construct upon the Indiana bank of the river a railway, the length of which will be about one and a quarter miles, and the width about 72 feet, with proper locks at each terminus: the whole to be of such magnitude as to be able, without discharging cargo, to pass steam-boats of the largest class, or say about 350 feet in length and 80 feet beam over the guards. The difference in level between the head and foot of the falls may be assumed at about 24 feet, and it is proposed to lift the boat a part of this height in the lock, and the balance by the grade of the railway. The power to be used will be one or more stationary steam-engines, applied to the moving of the carriage upon which the boats will be transported by means of a tow-rope or chain.

This project, although when first presented to the mind it may appear chimerical and difficult of execution, will be found, upon close examination, to be perfectly practicable, and to present less engineering difficulties than many other important works already successfully executed. The plans have been submitted to several eminent engineers, to obtain their views as to the feasibility of the project, and without exception, they have all concurred in the opinion that the work can be executed without difficulty, and at moderate expense.

The estimated cost of the work is 600,000 dollars; and it is estimated, from authentic data, that very soon after it is in successful operation, the receipts from toll alone will not be less than 150,000 dollars per year.

Gun Cotton.—Baron Von Senck, an Austrian artillery-officer, quartered as Mayence, is said to have made such improvements in gun cotton that it can now be made avail-

able for all descriptions of fire-arms. Professors Schönbein and Böttcher, the original inventors of the gun cotton, have sold their patent to the Austrian Government for 30,000 florins, under the conditions of disclosing their secret to no one else, and imparting at once to the Austrian Government any further improvements they may make.—*Literary Gazette.*

OFFICIAL DECISION OF GUARD, ENGINE-DRIVER, AND PASSENGER-COMMUNICATION QUESTION.

The long debated and increasingly important question of establishing communication between the guard and the engine-driver, and the guard and passengers of a train, was fully considered at the late Quarterly-meeting of the Board of Delegates of the Railway Clearing-houses, at which the necessity of this precautionary arrangement was recognized as a matter of principle, and the respective merits of the numerous proposed systems examined. On this occasion the subject was submitted to the consideration of the general managers, with a view to ascertain whether a plan for establishing these communications could not be devised, which would not involve any serious objections in practice.

The meeting gave its attention in the first instance to the important question of giving passengers the power of communication with the guard. Upon that point, however, without overlooking the possibility of such an arrangement being occasionally of service, the meeting could not persuade themselves that that communication would not tend to greater disasters than it could, on full view of the matter, prevent. Unless the guards and engine-drivers had orders to stop the train when a passenger made a signal, the privilege would be useless to the latter. It required, however, little acquaintance with railway travelling to be convinced that its dangers would be greatly increased if the train was to be stopped whenever, either from fear or from levity, a passenger might choose to make a signal. The meeting, therefore, were not prepared to recommend any arrangement which would put it in the power of the timid or reckless to control the discretion of the guard or engine-driver, and put the whole safety of the train in danger. The meeting saw much difficulty in the way, but were determined under no circumstances, should the privilege be conceded to the passenger, to asquiesce in it, unless the Legislature made the abuse of it penal.

The meeting then proceeded to consider the best means of enabling the guard and driver to communicate with each other, and it was decided that sound by air-whistles, compressed air-trumpets, and gunpowder were generally insufficient. Eventually it was decided that every tender should have a loud-sounding bell attached to it, at a point as close as possible to the place where the engine-driver stands; that the apparatus to be used for striking the bell be fitted with a contrivance for easily attaching a rope or line to it; that each guard-van be fitted with a drum having two divisions, the one smaller than the other, that the larger division be of sufficient capacity to hold, wound round the drum the coil of line, equal in length to the maximum length of the trains; that in the smaller division a cord be fixed and wound round the drum, having a balance-weight always in action suspended from the end of it, for the purpose of keeping the signal-line in a state of tension; and that the lever of the bell be fixed down by a spring of sufficient strength to resist its counterpoise weight, as well as the strain on the line at starting, and at other times, so that the bell may never ring except by the act of the guard; and finally, that the signal-line, when used, be carried along the carriages in the way in which experience may show to be the best, supported by spring receivers, of a simple construction, and to be attached to the lever of the bell.

This arrangement is precisely identical with that proposed by Mr. H. H. Henson, a gentleman of great practical experience, and a valuable member of the staff of construction of the London and North Western Railway Company. Mr. Henson patented his invention, in conjunction with his son, Mr. Frederick Henson, on the 17th Jan. last. It will, therefore, be seen from the recommendation of the above plan, that all the others have been rejected.

CASTING OF THE SCREW OF THE "AGAMEMNON."

On Saturday last, at two p.m., a casting took place in the foundry at Woolwich Dockyard, of a brass screw propeller for the *Agamemnon*, 91, screw steamship, at Portsmouth. The quantity of metal required for the casting was about eleven tons, and the time occupied in running it first into an iron pot made for the purpose, and subsequently into the screw propeller mould, was about twenty minutes. The iron pot employed was expressly made for being used when large castings take place, and is so constructed, that there is very little chance of accident occurring, as has been the case in some foundries, through some of the

boiling metal falling on the men. Lieut.-colonel M'Adam, Lieutenant-colonel Bury, and several of the officers of Royal Marines, Dr. Burns, Mr. Atherton, chief engineer, Mr. Macdonal, master attendant, Mr. Trickett, assistant to the chief engineer, and several of the officers of the yard, were present to witness the casting, and were much gratified by the excellent manner in which the men were enabled, by the working gear, to turn up gradually the iron pot, containing eleven tons of fluid metal, and pour it into the mould. The pot is suspended from a powerful crane, without the slightest apprehension of danger should any of the men withdraw from the gear, as it remains safely in the position in which it is left until the men again proceed with the operation. The screw was cast 18 feet in diameter; but it will be reduced, when finished, to about 16 feet, and the weight to about 8 tons.

The screw was taken out of its casting-frame on Monday afternoon, and is as perfect in every part as could have been wished. Workmen are now busily employed in removing the superfluous parts, and when it is finished in the engineer department, it will be sent round to Portsmouth as a reserve screw for the *Agamemnon*, at present at that port.

The workmen were engaged in the foundry on Tuesday in preparing for the casting of a brass tube 14 feet long and 21 inches in diameter inside, to be placed in the stern of the *Hannibal* screw steamship, to receive the shaft of her screw propeller. A similar tube was cast last week for the *Algiers*, 90 screw steam-ship, building at Devonport. Each of these tubes weighs 1 ton 18 cwt. The one for the *Algiers* has been finished in the engineer department.

GRIFFITHS' SCREW PROPELLERS.

The Fairy Royal yacht, Master Commander Welch, went out from Portsmouth on Friday last to try another of Griffiths' patent screws, under the direction of Capt. Crispin. The trials we lately reported of the screws on this principle were three-bladed screws, but as the rule of the service is to have all screws so constructed or fitted, that they can be raised to the deck through a well, or shaft, cut expressly for that purpose, and through which only a two-bladed screw, with the blades in a vertical position, can pass, a doubt existed as to whether the same results could be achieved with a propeller of two blades as was realised with that of three. The results of the trials of Friday, as furnished us by one of the patentees of Griffiths' screw, are reported as follow:—with the pitch of the screw at 8 feet 6 inches, 12·242 knots per hour; 10 feet pitch, 11·742 knots; and with 12 feet pitch, 11·092 knots.

The Boomerang Propeller.—The steamer *Genova*, worked by Sir Thomas Mitchell's Boomerang propeller, made a trial trip at Liverpool on Saturday afternoon. The result has not yet transpired.

THE TRADES OF BIRMINGHAM.

The heavier branches of manufacture of which iron is the material, and the contracts for which in many instances were taken before the late advances, are extremely busy. Messrs. Fox and Henderson, of the London Works, and Messrs. Cochrane and Co., of Woodside, have on hand immense work for the new Crystal Palace at Sydenham, and also for the London and North-Western and other Railway Companies, and almost as a matter of course the Messrs. Chance, of the Spon-lane Glass-works, participate in these orders. The span of the new iron and glass roof of the London and North Western station in New-street will, it is said, be the largest in the kingdom. Its erection, which is now fast proceeding, still gives employment to some hundreds of our best hands.

The manufacture of agricultural implements for the present season has set in with earnestness. Scarcity of labour appears to be the chief drawback, and good workmen are advertised for at high wages. The ensuing agricultural exhibitions throughout the country will show most satisfactorily the great advance which the Birmingham manufacturers have made, and are now making, in this important branch of inventive industry. The farmers of the midland counties already begin to appreciate the application of machinery in the cultivation of the soil, and the emigration of labourers in some districts has been so great as to render it absolutely necessary. These and other like circumstances have rendered the manufacture of agricultural implements of growing importance in Birmingham and the neighbourhood.

The factors of Birmingham, although greatly inconvenienced by the state of the metal-market, are busy, and, considering circumstances, orders, from commercial men now upon journey, are more than could be expected. Each season brings with it peculiar demands for Birmingham manufactures. The lamp-manufacturers at this season can afford to wait for the reduction in the price of copper. The winter demand

has not commenced, and to make for stock at the present time would be to incur almost a certain loss. Fortunately the export trade is more than usually good, and the numerous inventions and improvements which are constantly springing up in this particular branch of Birmingham trade enable the lamp-manufacturers to contend vigorously, if not successfully, with the French makers. There are now large orders on hand for the Mediterranean trade.

Copper has been offered more freely during the present week, and sold at a considerable reduction from the standard price. Several lots have been purchased at 135*l.* per ton, and report states even at a lower rate. Great quantities of sheathing and scrap metal have found their way into the market.

Zinc has also apparently reached its utmost price. Great quantities held in stock upon speculation have recently changed hands without breaking bulk, and must inevitably find their way into the general market within a very short period.

There is no change in the price of tin, the late advance of 5*l.* being well supported; if anything, the tendency is still upwards.

THE IRON TRADE.

The price of iron is stated to have been modified in several contracts during the present week; and an opinion prevails, whether justly or unjustly entertained, that at the preliminary meeting of ironmasters, which will be held during the ensuing week, a slight reduction will be announced. It is quite certain, however, whatever may be the determination of what is called "the trade," that the present, or rather the late extraordinary high price of iron cannot be universally maintained.

The suspension of Mr. Lemuel Goddard, engaged in the iron trade, was announced on Tuesday. The amount of his liabilities is not stated; but it is supposed they are rather considerable, and chiefly held in the north.

Glasgow Pig Iron-Market. — *Glasgow, March* 19.—For the last eight days our pig iron-market has been rather irregular; prices advanced slightly about the middle of the week, but have again declined to about the quotation of this day se'nnight—viz., 53s. 6d. sellers of warrants: buyers at 53s. A fair business has been transacted, chiefly for shipment. No. 1, g.m.b., is quoted 54s. 6d.; No. 3, 53s. 6d.; No. 1, Glengarnock, 55s.; and Gartsherrie, 55s. 6d. against bill of lading.

America.—Advices from New York to the 9th instant, brought to Liverpool on Monday morning, by the Royal Mail steam ship *Arabia*, inform us that the market of that city for Scotch pig iron and English brass was somewhat unsettled, and that less prices were obtainable.

THE MARINE LIGHTNING CONDUCTOR.

Sir William Snow Harris has just issued a series of interesting and important papers relative to his experimental researches on the Marine Lightning Conductor, upon which he founds a claim to public compensation, well worthy, as it appears to us, of favourable attention.

Those who have watched the progress of naval construction during the last thirty years, will be aware of the eminent services which this gentleman has conferred upon the public of this country, and, indeed, upon the world, by enabling vessels to withstand the most violent discharges of atmospheric electricity. With wonderful assiduity, and ingenuity of experimental research, he long prosecuted this important inquiry, in the face of repeated discouragements, which were of a nature to retard the most determined; because, in the novelty of the proposed arrangement, it was commonly feared that it would attract the fluid into the body of the vessel. Triumphing over all difficulties, he has had the satisfaction of seeing his plans universally adopted, and the man of science derives an almost equal gratification in taking a glance at the history of the subject which these papers disclose.

In 1820 the plan was brought forward by Sir W. Snow Harris, then Mr. Harris, and was rejected on that ground, although the navy had sustained in former years, and was still sustaining, severe losses constantly from this very cause in men, money, and ships. In an appendix to Sir W. Snow Harris's statement, which is addressed to the First Lord of the Admiralty, it is shown from official papers, that within about six years, and nearly within five years, 40 sail of the line, 20 frigates, and 10 sloops and brigs, were crippled and disabled by lightning; that the expenditure on account of damage to her Majesty's ships by lightning, was from 7,000*l.* to 10,000*l.* a year upon twenty-three years of war, and from 1,000*l.* to 3,000*l.* during the same term of peace; and that nearly 100 seamen were killed, and 250 hurt, upon 235 cases, most of which would subsequently receive pensions. It is shown also, as regards the merchant service, that within about the last

twenty years at least fifteen large ships have been burned, sunk, or destroyed, that immense inconvenience has been occasioned to the public service in the conveyance of troops and stores, and that it is extremely probable that many missing ships have perished in consequence of the electrical discharge. No efficient scheme existed for the protection of ships from these calamities, yet the Admiralty rejected, nevertheless, the plan of Sir W. Snow Harris, on the ground above stated.

Though rejected in 1820, however, it was ordered in 1830 to be tried in several ships of the navy, an enormous damage having occurred in the meanwhile to that arm of the public service. Nearly ten years afterwards, a naval and scientific commission was appointed to consider and report upon the subject, and that commission reported in February, 1840. In that document, the commission admitted in forcible language the great loss which the country had sustained in consequence of ships being unprotected from lightning, and urgently and unanimously recommended Harris's system of conductors. The procrastination and difficulty incidental to all government proceedings, was realised in this case most painfully. Notwithstanding the report, further experiments were ordered to be instituted, the result of which, it was intimated, was to "determine which of all the plans would be preferred." At length, in June, 1842, an order was promulgated for the general adoption in the navy of Harris's conductors. They have now had, in many instances, a trial of more than twenty years, and the result is, the complete disappearance from the navy of the shocking calamities, and vast cost, formerly entailed upon the service from the want of this protection.

To estimate the gain to the naval service which this invention has occasioned is no easy matter, though something like a result has been given above. The papers before us exhibit it upon undoubted official authority, as being, for the sixteen months from March, 1846, to July, 1847, fully 10,000*l.* A few detached facts will serve to show its amount more clearly. A 74-gun ship's mainmast of Riga spars, cost in the war, 1,008*l.*, and 848*l.* since the peace; a main-topmast nearly 140*l.* The mainmast of a first-rate costs 1,200*l.* A 44-gun frigate's mainmast costs 476*l.* in the war, and above 400*l.* in the subsequent peace. Topmasts of ships of the line varied from 140*l.* to 180*l.*; of frigates, from 80*l.* to 100.

The cost of a ship of the line is from 80*l.* to 110*l.* per day; of a frigate, from 30*l.* to 50*l.* per day; brigs and sloops, from 10*l.* to 20*l.* per day. Whenever, therefore, a ship of the navy is placed for a given time "hors de combat" by lightning, the country has to provide this heavy expense for ships not available for the public service.

With these facts before us, it must be confessed that Sir William Snow Harris has a strong moral case for claiming compensation from the country. His not having obtained a patent ought not to be allowed to operate against him; for this is really a national object, which though it might have been carried out under a patent right, could not then have responded to the dictates of humanity, and would probably have been purchased by the Government. We shall be glad to see the subject brought forward in Parliament, and trust it will receive a favourable consideration.

PILE-DRIVING BY MEANS OF GUNPOWDER.

The great extent to which mechanical ingenuity has been concentrated, for some months past, upon the improvement of projectile weapons, cannot fail to have attracted the attention of our readers. It has been apparent in our own columns, and, we think, not less so in those of our contemporaries. Political circumstances, happily in our age of a novel kind, reflected upon a comparatively recent historical period, and perhaps somewhat overheated in the imagination of two classes, the overtimid and the too readily pugnacious, account amply enough for this symptomatic phase of intelligence, always easily excitable, and always obedient to the demand of the hour. We see in all this the most promising signs. The progress of the peaceful arts is thus shown to be redolent of the means of war, only because they equally require the intelligent direction of natural agencies. The coming of the millenium may have its prologue, and before the sword and the spear shall be available for the plough-share and the pruning-hook, the inverse process may not be altogether a needless lesson.

However this may be, we cannot but be pleased to discover that the old notion of brute force has no longer a place amongst us. Nature has so constituted her creatures, that a certain amount of merely mechanical force is death and destruction to the strongest. She has given, at the same time, to one of those creatures a command—so far as we yet know—entirely without limit, over all the elements which she herself displays in the stupendous operations with which she has surrounded us. It is obvious, that with this destructive power at command, an infinitely less industry than that which has given us the steam-engine

and the cotton-factory would suffice for the suicide of the whole human race.

When war is shown to involve utter destruction, it must cease,—and to that completion it is rapidly coming. But if we chose to indulge in a slight historical sketch of what man has enacted in this terrific game,—how he has used his thew and sinew,—and how he has racked his brain, we shall be surprised at two facts—the first, that his implements of manual warfare should have been so effective; and the second, that his power over an incalculable, or rather, an uncalculated chemical agent, should have been so comparatively thrown away. We say advisedly, that the application of gunpowder and its congeners to the deadly purposes to which they have hitherto been directed is only just now falling into its due place among the many motive forces which man has subjected to his use. Their rational application to their old object demands our attention, only because it is rational,—that is, used with understanding. Our present number contains an example of the truth of this observation. Let us see whether this force, which escapes by its chemical celerity from the trammels which bind ordinary forces, cannot be made subservient to better purposes than the projection of death-dealing bullets and devastating bombs.

Our reflections upon this subject have not, it would seem, been entirely limited to ourselves. The improvers of guns, by revolving and breech-loading contrivances, have, no doubt unconsciously on their parts, excited an inquiry as to whether the same force which projects a bullet might not do a better thing,—economise human toil, and be made to perform duties too laborious for human strength, for which no adequate substitute in all cases has yet been found.

It has been suggested to us, that a very simple modification of a breech-loading piece of ordnance might become a very effective pile-driver. When we consider what has to be done in order to drive a pile home, it does appear to us that the sudden impact of explosion, if under control, is exactly the sort of force wanted for the purpose. The proposal is, that a ponderous gun or mortar, say three or five tons in weight, should be mounted in a vertical frame, breech upwards; that it should be free to move up and down between guides, as the monkey of the pile-driver does; that a plunger, or core of solid iron, should be turned to fit and entirely fill the bore of the gun, and that this core, or plunger, should be of such length as to project, as much as may be needful, beyond the muzzle of the gun when inserted into its place. We will suppose the gun, with its plunger, to be placed in the frame, breech upwards, and lowered upon the pile to be driven, so that the projecting end of the plunger may rest upon, and thus at once sustain and transmit the weight of the apparatus vertically to the pile. Let us now suppose that in the breech of the gun, above and behind the plunger, we have a chamber duly charged, which we could fire at discretion. It seems certain that the entire force of the explosion would be thrown vertically downwards upon the pile, which would yield to a succession of discharges, until its resistance became greater than the inertia of the inverted gun; after which, any further explosion would be expended on recoil only.

Further detail is scarcely necessary. The means of forming, charging, and firing a small chamber in the solid breech of the gun are sufficiently obvious. We are of opinion that a very small charge would be found sufficient if fired in a chamber many times less in diameter than the bore of the gun; because we should have in effect a Bramah's press acting by explosive impulse upon the whole surface of the plunger.

MARSTON'S PATENT BREECH-LOADING AND SELF-CLEANING RIFLE.

On Tuesday last we were present at a series of trials on the rifle-ground attached to Hornsey-wood House, with the American breech-loading and self-cleaning rifle, for which patents in America and in Europe have been taken out by Mr. Marston, of New York, the inventor. A great number of gentlemen, many of whom had turned their attention to the improvement of fire-arms, took part in the trials, which, as will presently be seen, were considered as conclusively demonstrative of the merits of the piece for rapid and accurate firing, and its general adaptation to sporting purposes, or to offensive and defensive operations.

This highly ingenious and effective weapon was fully described in No. 1538 of the *Mechanics' Magazine*, which also contained figures exhibiting the principle and main details of its construction. To that number we would refer such of our readers as desire to be minutely acquainted with its mechanical details. Its general nature and properties may be thus briefly stated:—In the first place it is a breech-loading rifle. The cartridge, which contains the shot, charge, and a perforated wad at the base, is

deposited in a small open chamber at the breech, formed by the removal of a breech-bolt, and is then thrust forward its own length into the barrel by simply working a lever, which acts upon the breech-bolt. In that position the piece may be fired; as the priming fire will pass freely from the nipple, through a perforation in the breech-bolt, which coincides with the nipple when the lever has completed its stroke, and through the perforated wad into the charge. As the perforation in the wad is concentric with the barrel, the whole of the charge is fired instantaneously, and thus a perfect economy of the gunpowder is effected. In the pieces used at the trial, which were of the size of the United States service rifle, only 37 grains of gunpowder were employed. Our regulation charge is 91 grains, though certainly the bore of the musket is considerably larger. The economy is such, however, that the cost of the powder saved is found to be sufficient to defray the expense of the manufacture of the cartridge.

In the second place, the rifle is self-cleaning. After an indefinite number of discharges, the interior of the barrel will be found to be as bright as it was on the day when it was delivered by the maker to the purchaser. This feature of the weapon is due to the wad, which being behind the charge, remains against the breech-bolt when the piece is discharged, and is carried out by the succeeding shot, and its edge being well greased, the barrel is literally polished at every discharge. The use of this weapon, therefore, amounts simply to priming, and opening and closing the lever to put in the successive cartridges.

In the trials of Tuesday, 138 rounds were leisurely fired with one rifle in the space of an hour, and 132 with another, a size smaller, in the same time. The firing began at 300 yards distance, at which about 40 shots were delivered. In the hands of Mr. Moulton, and a few of the gentlemen, who were reputed to be "good shots," the bull's eye was frequently hit, though the piece was in their hands for the first time. The targets were the approached, and firing took place at 200 yards and 100 yards respectively. Notwithstanding the high wind that was blowing at the time, the aims were extremely effective. The trial was partly instituted with reference to rapidity, with the results stated above, but much time was unnecessarily lost. The opinion of the judges present was, that the rifle was wonderfully effective for rapid firing, while for accurate firing it was certain to second an aim well taken. Trials for penetration at 100 yards showed that the balls passed through six stout planks, and flattened themselves upon the iron target behind. The same result was attained at 200 yards. No "kick" is perceptible with these pieces, and to exhibit their immunity from the effects of water, Mr. Moulton, before the trials began, filled the barrels with water, so as to moisten the entire surface of the bore—a test to which it would be highly imprudent to subject the ordinary rifle. A pistol on the same construction was found effective in aim and penetration at 200 yards, with a charge of less than 2 grains. Not one "miss-fire" occurred during the trial, and Mr. Moulton has offered to give a sovereign for every miss, provided he receives a penny for every hit. Judging from appearances, the bargain would be a profitable one to him were it extensively entered into. The invention was highly approved by all present, and we understand that it will very shortly come into extensive use in this country, as well as in France.

DEVELOPEMENT OF THE RAILWAY SYSTEM IN DENMARK.

An extension of the railway system from Hamburg, through the mainland of Denmark, to the northernmost part of that kingdom, has long been planned; as was noticed by us whilst detailing the operations of the North of Europe Steam Navigation Company. The terms on which the first section of the line is to be introduced are now published. This section is to consist of the 69 miles, which will constitute the most important part of the whole work. At present there is a line from Hamburgh through Holstein to the frontier of Schleswig, and the 69 miles proposed will comprise an extension of the communication through Schleswig to the Baltic port of Flensburg—a distance of about thirty-five miles—and a junction line of about thirty-four miles to the port of Tonning, on the German Ocean. By the transit from sea to sea thus to be opened up across the narrowest part of Denmark, 500 miles of dangerous navigation will be saved in the passage from London to St. Petersburg, Stockholm, Dantzic, and Stettin, as well as to Copenhagen, Elsinore, and all the other ports of the Danish islands, and the arrangements in conjunction with the North of Europe Steam Company will enable the Baltic to be reached in about thirty-two hours, Copenhagen in forty-eight, and Hamburg in thirty-six.

With regard to the probable results of the enterprise, it is stated that the Holstein (Kiel and Altona) Railway, of which the proposed line is to be a continuation, realized last year upwards of 7 per cent., although it cost 9,700*l*. per mile, and, as the

entire cost of the present one is not to exceed 7,500*l.* per mile, while its influence on commerce will in every respect be much more important, a higher and more rapidly increasing rate of return is relied upon. The calculation of the promoters as to the revenue immediately to be obtained from all sources amounts to 10 or 12 per cent.; but, in order to reduce the position of the shareholders to a certainty, an arrangement has been made by the contractors, Messrs. Peto, Betts, and Brassey, to lease the line from the date of opening for fourteen years, paying the shareholders a *minimum* rent of 6 per cent., and dividing equally with them the profits beyond that amount. 5 per cent. is likewise to be allowed on all payments till the opening of the line; and, as a security for the general performance of these conditions, the contractors are to deposit 100,000*l.* in the hands of three trustees—the Earl of Yarborough, Mr. Glyn, and Mr. Ricardo.

The undertaking is to be completed within fifteen months, and the concession from the King of Denmark, which is in perpetuity, embraces a clause against the establishment of any competing lines for a period of 100 years. The title of the company will be the Royal Danish Railway.

BRAE'S PATENT TORSION COMMUNICATING SIGNAL FOR RAILWAY TRAINS.

Our attention has been directed to the working models of a new method of communicating between the guard and engine-driver of a railway-train in motion, which has been invented by Mr. Andrew Brae, of Leeds. The plan proposed by this gentleman is one of considerable merit in point of originality and ingenuity, and though necessarily involving a number of parts in its mechanism, appears to be free from very serious disadvantages, which others, proceeding upon a different principle, present. In another part of this number will be found the decision which the Board of Delegates of the Railway Clearing-houses have come to upon this important question. That decision distinctly adopts a principle of arrangement which we cannot but regard as somewhat defective for practical purposes, and as being nearly certain to prove treacherous in the hour of danger. If a danger-signal is to be transmitted along a train, by means of a power exerted upon a flexible line in its own direction, that line will be liable to be broken, or to have its tension altered between distant limits. Mechanical corrections must be provided for this, and furnished to every carriage constituting the rolling stock of a company, or else a slack length must be drawn in before the signal can be transmitted, which might be fatal in a critical moment, or a false signal might be given in the opposite state of circumstances, which might be equally fatal. The latter alternative might be obviated by giving to the apparatus of the bell, or other instrument acted upon, a sufficient degree of friction to resist accidental impulses, but the same cause would operate prejudicially to its free action in its normal state.

The arrangement proposed by Mr. Brae is altogether on a different principle. depending for its effect on a torsive, or twisting force, applied to a long continuous rod, of such a construction as to transmit the torsive action from end to end of the train, no matter what figure the latter may assume in any part of its journey. For this purpose he proposes to have a straight tube of small bore, but of sufficient thickness to produce rigidity under a torsive motion, laid horizontally below the floor of each carriage. It is to be mounted in collars, within which it will be capable of moving freely, and motion will be imparted to it by means of the connecting pieces which continue the line of communication from carriage to carriage. These intervals are surmounted by a simple and very ingenious contrivance. A link is provided, equal in length to a large portion of the invertal, and united at either end by a universal joint on Hooke's construction, to a cylindrical rod equal in diameter to that of the bore of the tube under the carriage. These ends are run into the tubes before the carriages are coupled to make up the train; and in that state, though the connecting link can move backwards and forwards telescopically, it is prevented from dropping out by stops placed at the universal joints, in such a position as to insure a certain length of the terminal rods being within the tubes. These rods carry a longitudinal ridge, which fits into a corresponding slot in the tubes; and consequently, if any tube is twisted, it will twist the adjacent connecting links, which in their turn will twist the tubes adjacent to them on the remote side.

It is evident from this arrangement, that a torsive motion applied to this system of articulated rods at one end will be propagated immediately to the other, and become effective there in liberating the tap of a steam-whistle, in ringing a bell, or carrying out any mode of warning which may be settled upon. At the same time it will be equally obvious, in consequence of the

operation of the universal joints, that any amount of curvature in the train will not prevent the transmission of the signal.

Should the train be so long, and the curve of so short radius, that the engine should even be moving at right angles to the guard's carriage in direction, the warning would not in this arrangement be the less certainly given. These joints, indeed, would act effectually should the train assume the form of the letter S.

This is the principle of the invention, which, we need not say, admits of application equally to the communication between guard and engine-driver, and that between passenger and guard, should it at any time be determined to concede to the public the latter branch of this new precautionary arrangement.

Railway Machinery; a Treatise on the Mechanical Engineering of Railways, embracing the principles and construction of Rolling and Fixed Plant. By DANIEL KINNEAR CLARK, Engineer. Blackie and Son.

THE seventeenth part of this fine work has just been published, and well maintains the high character which the preceding ones have earned among the engineering community. As it advances towards its completion, it constantly affords fresh evidence of its value in the workshop; the promises of its title-page being realised to the full. An immense variety of different forms of construction of the principal details of locomotive mechanism are collected, their description accompanied with all the requisite working drawings, the leading dimensions stated, and the results of experience given upon each, with regard to the circumstances which should determine its adoption or rejection in practice. This, we have reason to know, is precisely what is wanted for the effectual developement of the locomotive system. It constitutes, in fact, a course of education which, though perhaps not absolutely essential, it is certainly desirable that all should pass through whose occupations or habits of thought lead them to the improvement of this mechanism. By instructing them minutely and clearly in what has been done by others, and pointing out the success or failure of particular inventions, much time and ingenuity is spared which may be precious for the general advancement of the subject: and while this useful object is accomplished, the routine of the workshop is certainly rendered more effective. With the aid of this admirable instruction, it can hardly be doubted that the artizans of Swindon, Wolverton and Crewe will appreciate more exactly the importance of the work in which they are severally occupied, to the successful working of the great whole which it contributes to; and when that is the case, a new impetus may fairly be expected to arise to the energy of improvement, of which such great establishments have always been the centres.

The engraved plates in the part before us contain transverse sections and end views, showing the fire-box, smoke-box, boiler, frame-stays, and valve-gear, together with the details of the valve-chest of Sharp's locomotive, the "Sphinx." Mr. Henson's coke-wagons, as employed on the London and North-eastern Railway, southern division, are illustrated in a sheet of elevations and plans, in which the figure and dimension of every part of the structure are exhibited. The letter-press part of the work continues the discussion of the action of the disturbing forces in a train in motion, pointing them out clearly so far as they are known and admitted, and stating at the same time the remedies which have been found adequate for their removal in practice. The arrangement of the frame, axle-bearings, and springs, the adjustment and number of the axles, are explained at considerable length, and illustrated by reference to plates in the preceding part of the work. Then follow a number of practical rules for the disposition of the axles, and the distribution of the load, upon which so much depends in the effective and economical working of the machine. These rules are extremely clear and practical, and being derived from a long and educated experience must be regarded as eminently valuable.

This portion of the work completes the general analyses of the engine, the boiler and the carriage; in studying which, the reader will enjoy the advantage of having before him the principal facts and observations upon which opinions and advice are founded. The subject is now pursued into what the author not improperly terms the "anatomy" and the "physiology" of locomotives, under which head the descriptive matter is illustrated by a multitude of wood-cuts, executed in a style of art commensurate with the high character of the work in a literary and artistic point of view. Every part of the locomotive, no matter how minute, is here fully described, and exhibited in a diagram, from which it can readily be made by the engineer, with the assistance of the instruction acquired from the context. Several examples of the principal parts, as proposed by the most eminent inventors,

are also given, and their relative advantages explained. It is wholly unnecessary to insist upon the great utility of such a work; and for the more rapid and more perfect development of the locomotive system, we earnestly hope to find that a place has been assigned to it in the library of every railway engineer, and, above all, that the constructive staff of every railway company have free access to it for study and improvement.

Photographic Manipulation. The Waxed-paper process of Gustave Le Gray. Translated from the French. George Knight and Sons.

THE beautiful art of photography, which has so rapidly advanced to its present distinguished position, has prospects before it at the present moment which must induce the least sanguine of speculators to anticipate speedy and still more splendid achievements. A host of amateurs are cultivating it successfully in every part of the world, corresponding societies are being established to promote its more effectual practice, and the press is furnishing experimentalists with the results of long and patient experience, reduced into the form of rules. The little book before us is one of these. It contains an epitome of the waxed-paper process, which consists entirely in the successful fabrication of the paper; and as this form of the art is eminently convenient for travelling, this perfect *vade mecum* should find its way into the possession of every photographer.

A Treatise on the Law and Practice Relating to Letters Patent for Inventions. By JOHN PAXTON NORMAN, Esq., M.A. Butterworths.

IN the present extraordinary development of invention consequent upon the more rational state of the law of patents, this work of Mr. Norman's is a highly acceptable contribution to the law library, and one which is certain to be eminently serviceable to inventors in the numberless questions of legal nicety in which they constantly find themselves concerned. The occasion for legal intervention in patent matters, notwithstanding the greater simplicity of the modes of procedure, will probably continue much the same in amount for some time to come; as patents have been, and must necessarily be, vastly more numerous under the operation of the new law, and in some of the important branches of art and manufacture, it will probably happen that there will be only nice lines of distinction between the scope of one patent and that of another. On the other hand, great and grievous as are the inconveniences and hardships of the law, it is by no means desirable that we should be without its salutary influence in inducing the most rigorous nicety of proceeding, and accuracy of language, in matters where they are of obvious importance. The law obliges every member of society to perform his duty to others and to the public according to the strictest principles of construction, and any departure from it may be severely visited upon him who is guilty of it. Such a power undoubtedly exercises a very excellent influence, especially in so critical a matter as patent rights, and its beneficial operation in this respect appears all along to have been tacitly acknowledged by the general body of inventors.

A clear, comprehensive, and popular manual of the patent law, exhibiting the great principles of this important branch of our jurisprudence, and illustrating their force and effect by a number of well-known "cases," is, therefore, extremely useful. Mr. Norman has rendered the volume before us especially useful by the great number of decisions which he has quoted, and the care he has taken to point out and explain the principles upon which they have been decided. The patentee, or he who contemplates becoming one, will find in its pages a copious and never-failing resource, when information or advice is wanting, and he will acquire besides a clear idea of the genius and spirit of the English law upon the subject of monopolies, which, for many reasons, it is desirable that he should keep in view, first in acquiring, and afterwards in asserting or defending his right, should he have occasion to do so.

The lawyer concerned in the conduct or detail of patent cases in the courts, will equally appreciate the merits of the book. Speaking deferentially on this part of the subject, but with the advantage of a rather ample experience of patent law practice, we are able to bear testimony to the admirable manner in which the subject has been developed in this book, the clearness of the language enunciating all the salient features of the law, and the accuracy with which particular cases and their application are stated. Nearly 600 cases are cited under the different sections of the work, in which its plan unfolds itself, bringing the subject down to its date at the present time; and for all practical purposes, it must take high rank among its rivals.

THE DOWLAIS IRON-WORKS.

The following account of the origin and gradual extension of the Dowlais Iron-works, which is abridged from an article upon the subject in the *Gentleman's Magazine* for last month, will be read with great interest by those who are familiar with the vast magnitude of that establishment.

The mineral lease of Dowlais was granted about the year 1748 by Lord Windsor, and under it was erected the first furnace in South Wales for the reduction of iron ore by means of pit-coal. By degrees the Guest family became possessed of a part of the interest of this lease, and, finally, on the death of his father, Mr. Thomas Guest, and of his uncle, by marriage, Mr. Taitt, in 1815, Mr. John Guest succeeded to nine-sixteenths, and his brother Mr. Thomas Revell Guest, to one-sixteenth of the whole. Mr. Thomas Guest, who was his only brother, died, childless, on the 30th January, 1837. After having spent a few years at school at Bridgnorth, and afterwards at Monmouth, Mr. John Guest passed through the different departments of the works, mastered the details of each, and the language of the people, and finally acted, under his uncle, as general manager. The concern was then in its infancy. Its produce, which in 1806 had been about 7,000 tons of pig iron, was even then only 20,000 tons, from four blast furnaces. The finances also were so embarassed, that it is said to have been a serious consideration with Sir John whether he should engage in the works, or push his fortune in some other direction. Having decided upon the former course, he speedily raised the number of furnaces to eight, and the annual production to 30,000 or 40,000 tons; and about 1824 there were eleven furnaces, and, by the introduction of new blowing machinery and improved arrangements for the raising and transport of the raw material, the annual production was raised to about from 45,000 to 50,000 tons.

About 1826, Dowlais boasted twelve furnaces, and the largest blowing engine then known. In 1831, Sir John patented a plan for running the melted metal at once from the blast furnace into the refinery, by which means he effected a considerable saving in fuel and in the waste of metal, and rendered his works equal to the annual production of 60000 tons, thus taking in the trade the lead which he ever afterwards maintained. In 1835, there were fourteen furnaces; and to meet the rising demand for railway bars, and, notwithstanding the approaching termination of his lease, he had the spirit, in Aug. 1840, to augment the furnaces to eighteen, and by the introduction of various improvements (patented) in the manufacture, he raised the power of production to 100,000 tons annually, and actually produced that quantity of raw iron in 1849, when he sent into the market 75,000 tons in the form of bars and rails.

The steam power which, in 1815, was inconsiderable, at this time amounts to 4,989 horse power, of which the blowing engines employ 2,063, the forges and rolling mills 1,380, the coal and ore-works 967, brick-making 17, stabling 9, and locomotion 554. As recently as 1814, the ore was carried to the furnaces in sacks and panniers on the backs of mules. In 1849, there were 500 horses employed. The Dowlais Works freight, on an average, a ship a day in the port of Cardiff. Of ore, coal, and limestone, about 740,000 tons are annually raised, besides about 1,171,000 tons of shale and useless matter, raised to be thrown aside. In 1815, Dowlais contained from about 1,000 to 1,200 work-people, residing in 100 cottages. At this time there are probably 3,000 cottages and 15,000 inhabitants, of which about 7,000 draw pay direct from the works. The money payments in labour rose in 1845-6-7 to 30,000*l.* per month, or 360,000*l.* per annum,—a sum, the mere providing of which in coin to meet the weekly demand, was a somewhat weighty financial operation. At one time Sir John Guest possessed a bank at Cardiff. He was also an original promoter of, and a very large shareholder in, the Taff Vale Railway, of which he was for many years the chairman, and always its principal freighter.

Sir John died, as he had ever wished to die, at Dowlais, amidst his own people, and is there buried. His funeral was attended by an immense concourse of about 20,000 persons, most of whom were more or less connected with his works. By common consent all business and work were suspended, and the shops closed in the district. Notwithstanding his great wealth, and his position at the head of a principal branch of British industry, Sir John Guest preserved habits of great simplicity, was humble in his estimate of himself, and singularly unobtrusive in his deportment, so that few were aware of the real extent of his information. During the Merthyr riots of 1831, he showed, under very trying circumstances, great personal courage. After all negotiations had failed, he interposed between the soldiers, just about to fire, and the people, whom he addressed in their own language, and solely by his personal influence prevented a very serious effusion of blood.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MARCH 21, 1853.

HENRI FRANCOIS TOUSSAINT, of Paris, gentleman. *For improvements in obtaining a product from the wood of the cactus.* Patent dated September 10, 1852.

The "product" which the patentee obtains from the cactus, or rather from that variety of the tribe known as the Barbary fig-tree, is a fibrous network, which may be used for many purposes of use and ornament.

The trunk, branches, and leaves of this tree are composed of a number of layers of such network, which is obtained for use by first scraping the exterior of the particular parts under operation, and then steeping them in acidulated water or an alkaline solution until the layers of network will readily separate from each other; when dry, they may be employed as the taste of the manufacturer may dictate, and with or without any kind of ornamentation, in producing book-covers, &c.

The patentee claims "the product itself; that is to say, the preparation of the woody portion of the leaves of the opuntia or cactus, and its application to the manufacture or ornamenting of a great number of articles."

ALEXANDER STEWART, of Glasgow, North Britain, manufacturer. *For improvements in the manufacture or production of ornamental fabrics.* Patent dated September 10, 1852.

The *first* part of this invention relates to the production of fabrics of the Mousseline de Laine class, composed of mixed animal and vegetable fibres, and of composite fabrics generally. The improvements consist in weaving such fabrics from plain or coloured or printed threads, both for the warp and weft, then dyeing the whole fabric in the piece to produce the ground-colour, and afterwards applying a discharger, such as alkali, acid, &c., printed by means of rollers or otherwise, according to the pattern required to be produced; or instead of proceeding in this manner, a resist or reserve is printed on the fabric previous to the padding, dyeing, or blotching process, whereby those parts only will receive and retain the colour on which the resist has not been applied.

The *second* part of the invention relates generally to the production of ornamental fabrics, when the ornament is produced by printing, and consists in weaving the same and then applying a resist or reserve previous to the dyeing process; or the resist might be applied in conjunction with one set of colours, so as to prevent a subsequent application of colouring matter from affecting the parts so treated.

The patentee claims the systems or modes described of producing ornamental fabrics; and then in detail the several modes of proceeding above-mentioned.

STEPHEN TAYLOR, of New York, gentleman. *For certain improvements in the construction of fire-arms, and in cartridges for charging the same.* (A communication.) Patent dated September 10, 1852.

The invention specified under this patent is that of Mr. Marston for the breech-loading gun and cartridges, of which a full description, with engravings, has already appeared in our pages (*ante* p. 83).

The claims made in respect of the invention are,

1. Actuating the sliding breech-pin by means of a radius-bar, which will act as an abutting lever and prevent the breech-pin, when in its forward position, starting from its place on the discharge of the fire-arm.

2. The application of the leather sole or breech-piece to cartridges used with breech-loading fire-arms; such leather breech-piece or sole serving the purpose of a protection to the breech-pin, a wad for the next cartridge in succession, and of a swab to clean out the soilage caused in the barrel by the antecedent explosion.

JULIAN BERNARD, of Guildford-street, Russell-square, gentleman. *For improvements in the manufacture or production of boots and shoes, and in materials, machinery, and apparatus connected therewith.* Patent dated September 10, 1852.

Mr. Bernard's improvements consist—

1. In certain mechanical arrangements for lasting or mounting the uppers of boots and shoes.

2. In machinery for boring or screwing holes in the soles of boots and shoes, and for introducing plastic material or cement for connecting together the parts to be united.

3. In a mode of stitching or ornamenting the soles of boots and shoes.

4. In a method of waterproofing and strengthening the uppers of boots and shoes, whereby the stitching of the strengthening pieces or lining can be dispensed with. And,

5. In an arrangement for stitching or sewing together materials in the manufacture of boots and shoes.

JOHN WRIGHT TREEBY, of Elizabethan Villa, St. John's-wood, gentleman. *For improvements in regulating the flow of liquids.* Patent dated September 10, 1852.

Mr. Treeby describes two arrangements of valves actuated by floats for regulating the supply of water to cisterns and thus preventing waste from overflow or other causes.

In the first of these the valve is of the disc construction, and is mounted in a casing in the bottom of the cistern in communication with the inflow-pipe. It is attached by a long stem to the float, which moves vertically over the valve-casing rising and falling with the varying level of the water, and thus closing or opening the valve according as the water-level in the cistern is at its proper height or reduced by use of the water. The valve has a spring applied at the point where it is connected to its stem to prevent the effects of concussion when brought suddenly in contact with its seat.

In the second arrangement, the valve is a simple slide applied at one side of the cistern, and actuated by a float attached to a bent stem connected to the slide. The rising and falling of the float moves the slide in contact with its seat, and thus regulates the supply of water to the cistern.

Claim.—Regulating the flow of liquids by mounting cut-off valves in such manner that they may be closed and kept to their seats by the joint action of the supply liquid, and that which has passed the valve, and that by the action of the specific gravity of the valves and their connections they may be opened on the decrease of the liquid-level in the cistern or reservoir to which they are applied.

Charles Augustus Preller, of Abchurch-lane, London, merchant, John Eastwood, of Bradford, York, woolcomber, and Samuel Gamble, of Bradford, aforesaid, machine-maker. *For improvements in machinery for combing, drawing, or preparing wool, cotton, silk, hair, and other fibrous materials.* Patent dated September 16, 1852.

Frederick Sang, of Pall-mall, artist in fresco. *For certain improvements in floating and moving vessels, vehicles, and other bodies on and over water.* Patent dated Sept. 16, 1852.

This invention consists in floating and moving vessels and bodies on and over water by means of hollow buoyant floats or drums, with or without paddle-boards at their peripheries. These floats or drums may be of such size and displacement as wholly to sustain the vessel to which they are attached above the surface of the water; or the vessel may be only partially sustained by the drums and partly by floating on the water; or the drums, with float-boards attached, may be applied to ordinary steamers in lieu of paddle-wheels. In every case the propulsion of the vessel will be effected by setting the drums in revolution by means of a steam-engine in the vessel; or, instead of applying drums to support and propel the vessel, an endless chain of caissons or hollow vessels may be applied on either side of the ship, and motion may be given to them by any convenient means.

The claim is, in effect, for the use of the hollow buoyant drums or vessels when applied in manner and for the purposes described.

William Smith, of Little Woolstone, Bucks, farmer. *For improvements in machinery for reaping.* Patent dated September 18, 1852.

The peculiarity of Mr. Smith's reaping machine consists in the employment of a series of rotary cutters, each having six or more curved arms, working in combination with angular guides, between which the straw to be cut is held during the act of cutting. The cutting-edges of the arms of the cutters are toothed like a sickle, and the inner angles of the guides are provided with cutting edges similarly formed. The cut corn is thrown to one side of the machine by means of an endless band, furnished with projecting arms, revolving in front of and above the level of the cutters, so that the arms shall clear the ground, but without allowing any of the cut corn to escape them. The machine is propelled from behind, and the corn is laid down away from the cutters by means of a frame projecting from the front of the machine.

Claim.—The mode described of constructing and combining rotatory cutters and apparatus into a reaping machine.

PROVISIONAL PROTECTIONS.

Dated February 10, 1853.

353. William Edward Newton Improvements in instruments or apparatus for facilitating the examination of various internal parts of the human frame. A communication.

Dated February 25, 1853.

474. John Hynam. Improvements in the mode of manufacturing wax or composition tapers, and in the machinery or apparatus for that purpose.

Dated February 28, 1853.

497. Theodore Baron Von Gilgenheimb. A new machine, with its adjuncts or other apparatus, to be used for agricultural pur oses.

499. Thomas Edward Merritt. Improvements in railway carriages, and in connecting and disconnecting them.

501. Edward Hammond Bentall. Improvements in harrows.

503. Peter Armand Lecomte de Fontainemoreau. Improvements in drying cigars. A communication.

595. Samuel Cunliffe Lister. Heating and making cards.

Dated March 1, 1853.

507. Thornton Littlewood and Charles Littlewood. Improvements in machinery or apparatus used in the preparation of wool, silk, flax, and mohair to be spun.

509. Joseph Clisild Daniell. Propelling vessels of all descriptions that float on water that are

capable of carrying steam or any other engines used for the purpose of giving power to propel vessels, also for propelling carriages on roads to which engines for the purpose of giving power to work them can be applied.

511. Edward Charlesworth. Improvements in bill or letter-holders.

513. Charles Flude and James Waterman. Improvements in the application of heat for producing evaporation, generating steam, and for general heating purposes, and also in the economical production of combustible gases for the purpose of illumination.

515. Robert Lewin Bolton A new mode of obtaining and using power by explosion of gases.

Dated March 2, 1853.

517. Charles Henry Hall. An improved apparatus for cooking by gas or vapour.

519. James Abbott. Certain improvements in and applicable to machines for winding yarn or thread. called "winding machines" used in the manufacture of cotton and other fibrous substances.

521. John Smith, William Henry Smith, and Alexander Williams. Certain improvements in metallic plates, and in producing devices or ornamental patterns thereon, and in the apparatus and machinery to be used for such purposes.

523. Lewis Jennings. An improved apparatus for regulating the speed of machinery.

525. Robert Waddell. Improvements in steam engines.

527. Willoughby Theobald Monzani. Improvements in reaping-machinery.

Dated March 3, 1853.

529. James Murdoch. An improved process for the manufacture of iodine. A communication.

531 Charles Humpage. The application of certain materials to the manufacture of coffin furniture.

533. Auguste Edouard Loradoux Bellford. Improvements in locomotives, part of which improvements are applicable to other steam engines. A communication.

535. Samuel Colt. Improvements in rotating breech fire-arms. Partly a communication.

537. Samuel Colt. Improved machinery for forging metals. Partly a communication.

539. Bernard Chaussenot the elder. Improvements in apparatus for aërating liquids.

541 John Wright Improvements in machinery for manufacturing bags or envelopes of paper, calico, or textile fabrics.

543. James Waterman. Improvements in treating brewery and distillery grains, for the production of food for cattle. and for extracting the bitter principle and other products from the refuse hops of breweries.

Dated March 4, 1853.

544. John Hinks and George Wells. A new or improved metallic pen.

545. Robert Craib Ross. An improved machine or instrument for cutting files and forging metals.

546. George Elliot. Certain improvements in manures.

547. Joseph Sparkes Hall. Improvements in cutting out parts of boots and shoes.

548. William Sandilands. An improved hopper for a pianoforte

549. Samuel Hazard Huntly. Improvements in controlling and regulating the flow or pressure of gas.

550. Henry McEvoy. Improvement in covered buttons.

551. George William Bott. An improvement in apparatus called "pressers," employed in the preparation of cotton and other fibrous materials for spinning.

552 James Boydell. Improvements in the construction of bedsteads.

553. John Davie Morries Stirling. Improvements in manufacturing coated metal.

Dated March 5, 1853.

554. Mary Ann Smith. Improvements in the manufacture of toys. models, and other like articles of ornament or utility.

555. John Gedge. Improvements in the construction of fire-arms, and in the means of loading the same A communication.

556 Baldwin Fulford Weatherdon and Charles Dealtry. Improvements in the construction of certain floating vessels, and in the mode of propelling them.

557. Thomas Wells Cross. A portable fire-engine.

558. William Todd. Improvements in steam engines.

559. Joseph Maudslay. Improvements in screw propellers for ships and other vessels.

560. Richard Archibald Brooman. Improvements in machinery for making pipes and tubes. A communication.

561. John Hirst, junior, and William Mitchell. Improvements in stretching fabrics.

Dated March 7, 1853.

562. Richard Barter. Improvements in cutting roots and other vegetable substances.

563. William Barrington. Improvement in life-boats.

564. James Gascoigne Lynde, junior. A pressure governor, or self acting apparatus for regulating the flow of water.

565. Henry Mapple. Certain improvements in electric telegraphs and apparatus connected therewith.

566. André Calles. Certain improvements in manufacturing typographic characters

567. Jacques François Dupont de Bussac. Certain improvements in paving and covering places. A communication.

568. Godfrey Simon and Thomas Humphreys. Improvements in carriages.

569. William Matthews. Improvements in pianofortes.

570. Joseph John William Watson. Improvements in illuminating apparatus, and in the production of light.

571. Thomas Weatherburn Dodds. Improvements in the treatment and manufacture of iron and steel.

572. Charles Parker. Improvements in weaving.

573. John Little. Improvements in cooking apparatus.

574. Thomas Weatherburn Dodds. Improvements in the manufacture of wheels and axles.

576. Thomas Turner Chatwin and Robert Mc Leish. Improvements in rollers, rods, or poles, for window-blinds, curtains, maps, and such like purposes.

Dated March 8, 1853.

578. Charles Finlayson. Improvements in apparatus for converting reciprocating into rotatory motion for steam engines, and for other purposes.

579. Thomas James Perry. A new or improved method of constructing cornice-poles. and picture and curtain rods and other rods from which articles are suspended

580. Thomas Dryland. An improved portable iron stove.

581. Jacques Francisque Pinel. Improvements in deodorizing sewage water and cesspools, and in manufacturing manures.

582. Nicolas Schmitt. Improvements in cleansing and separating ores and coal.

583. Charles Baker. Improvements in moulds for the manufacture of bricks.

585. John Wright Improvements in the construction of bedsteads and other frames.

586. Alexander Samuelson. Improvements in the manufacture of bricks and tiles.
587. Frederick William Emerson. Improvements in obtaining tin from ores.
588. James Veevers. Certain improvements in machinery or apparatus to be employed in the preparing of cotton and other fibrous materials for spinning.
589. Thomas Glover. A certain improvement in the construction of buttons, and in the mode of applying the same to gloves and other articles of dress.
590. John Colquhoun. Improvements in bleaching or sulphuring silk, woollen, cotton, and other woven fabrics and yarns.
591. John James Alexander Maccarthy. Improvements in gunnery and projectiles, with pouch for the latter, which are adapted for muskets, rifles, pistols, and heavy cannon for field-pieces or forts, batteries, ship of war, and other vessels.

Dated March 9, 1853.

592. James Kimberley. A new or improved gas-stove.
594. Samuel Blackwell. An improved strap or band for connecting together certain parts of harness and saddlery, applicable also to other purposes where straps or bands are used.
598 William Pidding. Improvements in the treatment or manufacture of caoutchouc or gutta percha in fabrics obtainable therefrom, and in the machinery or apparatus employed therein.
600. Theophilus John Nash. Improvements in churns.
602 Edward Maitland Stapley. Improvements in machinery for breaking and dressing flax and other fibrous materials. A communication.
604. Williom August Holskamp. An improved castor for legs of furniture and other purposes.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 18th,* 1853.)

439. Martin Walter O'Byrne and John Dowling. A machine for cutting paper, mill-board, leather, vellum, sheet metal, and other suitable materials for useful and ornamental purposes.
445. George Gotch. Certain improvements in transmitting intelligence upon railways.

(*From the "London Gazette," March 22nd,* 1853.)

531. George Evans. Improvements in treating peat and other carbonaceous matters.
590. William Petrie. Improvements in the manufacture of sulphuric acid.
609. John Nicholas Marion. A new mode of rendering concrete coleseed oil.
630. Henry Spencer and Edmund Taylor. Improvements in steam engines and boilers.
668. Charles Frederick Day and John Laylee. Certain improvements in sleepers and other parts of the permanent ways of railroads.
878. Thomas Charles Medwin. Improvements in water-gauges, or instruments for indicating the height of water in boilers
996 John Symonds and George Mouchet. An improved mode of cleaning or scaling metallic surfaces
1048. James Bell. Improvements in railway chairs.
1138. Thomas Vicars the elder and Thomas Vicars the younger. Improvements in baking-ovens, and apparatus for placing the bread, biscuits, or other articles to be baked therein.
47. Charles William Lancaster. An appendage to bullet-moulds.
57. William Henderson. Improvements in manufacturing sulphuric acid and copper from copper ores, reguluses, and matts.
59. Francis Parker and William Dicks. Improvements in boots, shoes, and that kind of spatterdashes termed antigropelos
135. Celestin Malo. Improvements in steam generators.
328. Auguste Edouard Loradoux Bellford. Improvements in metal musical wind instruments, to be called "Bessan's system." A communication.
362, Robert Roger. Improvements in obtaining motive power.
363. William Potts. Improvements in sepulchral and other commemorative monuments.
421. Charles Watt and Hugh Burgess. Improvements in coating iron with copper and brass.
436. Pierre Auguste Tourniere. Improvements in propelling.
451. Pierre Frederick Gougy and David Combe. Improvements in apparatus for skidding or stopping wheels of carriages and other vehicles.
453. John Richard Cochrane. Improvements in the manufacture or production of ornamental or figured fabrics.
474. John Hynam. Improvements in the mode of manufacturing wax or composition tapers, and in the machinery or apparatus for that purpose.
475. Benjamin Price. Certain improvements in the construction of furnaces or flues of steam boilers, coppers, and other like vessels for heating or evaporating liquids.
476. John Grist. Improvements in machinery for the manufacture of casks, barrels, and other similar vessels.
501. Edward Hammond Bentall. Improvements in harrows.
505. Samuel Cunliffe Lister. Heating and making cards.
507. Thornton Littlewood and Charles Littlewood. Improvements in machinery or apparatus used in the preparation of wool, silk, flax, and mohair to be spun.
515. Robert Lewin Bolton. A new mode of obtaining and using power by explosion of gases.
517. Charles Henry Hall. An improved apparatus for cooking by gas or vapour.
522. Edward Duke Moore. An improved mode of treating the extract of malt and hops.
523. Lewis Jennings. An improved apparatus for regulating the speed of machinery.
525. Robert Waddell. Improvements in steam engines.
535. Samuel Colt. Improvements in rotating breech fire-arms. Partly a communication.
536. Samuel Colt. An improved construction of blower. A communication.
537. Samuel Colt. Improved machinery for forging metals. Partly a communication.
538. Samuel Colt. Improvements in rotating breech fire-arms. Partly a communication.
540. William Edward Newton. Improvements in primers for fire-arms. A communication.
546. George Elliot. Certain improvements in manures.
552. James Boydell. Improvements in the construction of bedsteads.
553. John Davie Morries Stirling. Improvements in manufacturing coated metal.
555. John Gedge. Improvements in the construction of fire-arms, and in the means of loading the same. A communication.
579. Thomas James Perry. A new or improved method of constructing cornice-poles, and picture and curtain-rods, and other rods from which articles are suspended.
585. John Wright. Improvements in the construction of bedsteads and other frames.
586. Alexander Samuelson. Improvements in the manufacture of bricks and tiles.

587. Frederick William Emerson. Improvements in obtaining tin from ores.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

598. James Hogg, junior. Certain improvements in machinery or apparatus for cutting paper and other substances. March 9th.

WEEKLY LIST OF PATENTS..

Sealed March 19, 1853.

1852:

12. Thomas Wood Gray.
377. Martyn John Roberts.
435. John Goodman.
508. William White.
553. Charles Frederick Bielefield.
593. Edward Lawson.
832. John Beale.
1139. John Livesey
1189. Benjamin Glorney.

1853:

38. William Edward Newton.
39. William Edward Newton.
85. William Nairne.
111. Thomas Cropper Ryley and Edward Evans.

Sealed March 23, 1853.

1852:

18. Thomas Dickason Rotch.
76. Christopher James Schofield.
90. John Aspinall.
100. William Potts.
107. Henry Columbus Hurry.
178. William Edward Newton.
189. Alexander Willison.
216. Archibald Brown.
220. David Stephens Brown.
226. Diego Jimenez.
252. Jacob Tilton Slade.
267. Thomas Barker Walker Gale and Jonathon Fensom.
280. William Bissell.
310. William Edward Newton.
352. Thomas Dawson.
353. Thomas Lacey.
361. Joseph Pimlott Oates.
388. Alsop Smith.
455. Auguste Edouard Loradoux Bellford.
584. George Thomas Selby.
586. George Thomas Selby.
610. William Edward Newton.
612. James Dible.
647. John Henderson Porter.
686. Nelson M'Carthy.
714. Henry Huart.
806. William Dray.
828. Michael Leopold Parnell.
884. Robert Barnard Feather.
892. Daniel Woodall.
958. Alexander Lawrie.

1853:

35. Edmé Augustin Chameroy.
137. John Crabtree.
146. Augustus Thomas John Bullock.
158. William Joseph Curtis.
174. David Clovis Knab.
187. Frederick Simpson.
189. Alfred Vincent Newton.
191. Robert William Siesver and Robert William Waithman.
193. John Edward Mayall.
200. John Henry Johnson.
201. James Combe.
212. William Tranter.
216. George Edmond Donisthorpe and John Crofts.
217. James Pole Kingston.
219. John Scott Russell.
223. Harold Potter,
226. Henry Moorhouse.
231. Richard Archibald Brooman.
234. William Watson Hewitson.
240. William Edward Newton.
257. Israel P. Magoon.
272. Joshua Murgatroyd.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

A. Z.—The piston of your pump being 14 inches in diameter, has an area of 154 square inches, or $\frac{154}{144}$ square feet. The length of the lift is 90 yards, or 270 feet, which gives $\frac{154}{144} \times 270$ cubic feet for the contents of the barrel. This must be multiplied by 10, the number of strokes per minute, and by the length of the stroke, which you do not state. Assuming it to be 6 feet, multiplying the result again by 62½lbs., the weight of a cubic foot of water, and dividing by 33,000, according to the rule for estimating horse-power, the result comes out at nearly 33 horse-power. If the length of stroke has been wrongly assumed, the result will be greater or less, in the same proportion as 6 is greater or less than the true length of stroke. But this will be the equivalent labour exerted in raising a cylindrical body of water 90 yards deep, and 14 inches in diameter, 10 times a minute, through 6 feet at each stroke. Two settings should be sufficient for the work. With the engine you propose, working up to a pressure of 10lbs. per square inch, the power given out would be nearly 23-horse.

W. K., Northampton, asks whether we can furnish him with simple directions for making a permanent liquid glue The following method of preparing that useful article is taken from the *Comptes Rendus de l'Académie des Sciences, Sept.* 1852: and as the glue so made is applied cold, and does not require heating, it will be found of great use. It is prepared as follows:—Take of strong glue 1 kilogramme, (2·2 lbs. av., 2·7 lbs. troy,) dissolve it in 1 litre (nearly a quart) of water, in a glazed pot on a slow fire, or, better still, over a water-bath; stir carefully from time to time. When all the glue has melted, add little by little 200 grammes (6·5 oz. troy, 7 ozs. av.) nitric acid, spec. grav. 1·33. This addition produces an effervescence due to the disengagement of nitrous acid. When all the acid is poured in, the vessel is removed from the fire and suffered to cool. Glue thus prepared has been preserved for more than two years in an uncorked bottle, and during that time it underwent no change.

A Subscriber, desirous of completing his knowledge of drawing and colouring. Both the books to which you refer include the subjects of colouring, tinting, and the projection of shadows in their respective courses. The plan of study as to the details of the general subject is not the same, judging from the selection of plates in the first numbers and the letter-press; but as the entire range of mechanical drawing and its collateral arts will be exhausted in both treatises, this is a matter of secondary importance. From either of them you would be certain to learn what you desire to acquire, supposing that you practice sufficiently, and possess ordinary aptitude. Both works are to be completed in about twelve monthly parts, at two shillings each.

Mr. John Whitford, Ware.—We feel obliged for your mathematical communication, but are reluctantly obliged to decline it, the subject to which it relates not presenting any new bearing in the arts or sciences.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Mar. 11	3431	W. Brooks	Aldgate	Sausage-machine.
16	3432	G. Clark	Kingston-on-Hull	Seamless block boot.
21	3433	G. Dowler	Birmingham	Inkstand.
23	3434	Brooker and Son	Edmonton	Carriage-step and cover.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Mar. 18	497	J. Bagnall and S. Limebeer	St. Pancras	Portable house.

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ALLAN'S OIL AXLE-BOX FOR ENGINES AND TENDERS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 5.

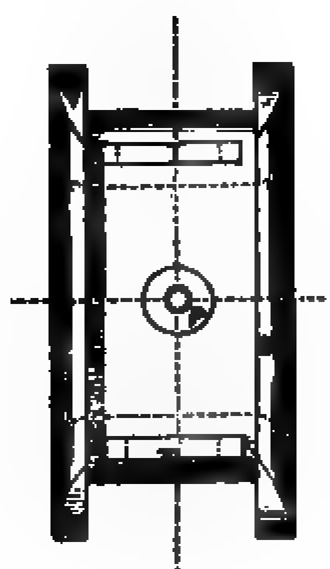

Fig. 4.

ALLAN'S OIL AXLE-BOX FOR ENGINES AND TENDERS.

THE accompanying figures represent an oil axle-box, invented by Mr. Alexander Allan, of Crewe, for the driving-wheels of passenger-engines, and for tenders.

Figs. 1 and 2 are respectively a longitudinal and a transverse section of an engine axle-box for the leading and trailing wheels; and figs. 3, 4, and 5 respectively a longitudinal section, a transverse section, and a plan of an axle-box for engine driving-wheels. The following description of the arrangements was given in a paper on the subject, written by Mr. Allan, which was read at the January meeting of the Institution of Mechanical Engineers, Birmingham.

A is the axle-box, which is made of cast-iron, with two wrought-iron pieces cast in the sides of it. B, the axle-step, which is carried 1 inch below the centre, to assist the sides in resisting the horizontal thrust. The inside edge W is also carried lower than the outside of the sponge-box, which carries the oil over the joint of axle-step and sponge-box joint. S, the sponge-box, in which are placed one or two pieces of sponge, a little thicker than the distance from the axle to the bottom of the sponge-box. The axle is 6½ inches in diameter, and is supplied with oil by a covered syphon-box on the top of a straight tube about 3 feet long, and directly over the axle at X, which tube goes 1¼ inches into the axle-box, and allows the engine to rise or fall 1¼ inches. The delivery of oil on the proper place is therefore certain. I I are two pins, ½-inch round iron, to support the sponge-box.

The connection with the spring is shown at E, and F is the pin which connects E with the sides of the axle-box. T are pieces of wrought-iron cast in the axle-boxes; the lower ends of which are drilled for the pin F.

Axle-boxes for the leading and trailing wheels of passenger-engines, and of tenders similar to those experimented on, are shown in figs. 3, 4, and 5. A, a cast-iron axle-box, with a strong covered top to support the weight, underneath which is a cored-out hollow space, open at one end, and into this hollow the brass oil-cup C is fitted. B is the axle-step, 1 inch thick, with 3 snugs to resist the lateral strain, and 2 counter-sunk oil-holes. C is the oil-cup which has two tubes forming syphons; and H is a handle for lifting it out to trim, &c. S is the sponge-box, into which the narrow slip of sponge is placed, to catch the surplus oil as it leaves the axle-bearing.

In accordance with a request expressed at the previous meeting of the Institution, the following experiments had been made on the consumption of oil in the axle-boxes of tenders alone, fitted with oil-receivers and sponges for collecting the oil, as described above. These experiments lasted seven days, and exhibited the following expenditure:

	s.	d.
6·08 quarts of oil used, at 9d. per quart	4	6¾
Four sponges, at ½d. each........................	0	2
For running 6,000 miles	4	8¾, or ¾ per day.

This result was obtained by running 1,972 miles, with 3 tenders, and reduced to 6,000 miles, as a mean of comparison with the axle-box described at the previous meeting. The same system has been in operation on the Northern Division of the London and North-Western Railway for the last ten or twelve years.

THE IRON TRADE.

THE iron trade is still firm, and prices have been exceedingly well maintained throughout the past quarter. A slight reduction has, however, taken place. Pigs are now 4*l*. 10s., and orders will not be refused for bars at 10*l*., although 11*l*. is the quotation. The general belief is that the masters will maintain the same quotation for the ensuing quarter, which commences immediately. The irregularity of the men in many parts of the district is a serious drawback on their own comforts, and the interest of their employers. The furnaces are allowed to stand all but idle two or three days in the week, and great embarrassment in the execution of orders is the consequence. A further symptom of the declining state of the market is the fact that some makers of iron, as well as copper merchants, are soliciting orders at small reductions of existing rates. There are plenty of orders to give out, but the uncer-

tainty which prevails as to the price of the raw material greatly restricts the make of hardware goods.

The orders received by the last packet from North America are not so numerous or heavy as they were during the last month, but it is satisfactory to observe that, notwithstanding the reported activity of the American iron-masters, and the high prices prevailing in this country, there is a considerable demand for British iron. Rails are more particularly in request for the markets of the United States, and large quantities of South Staffordshire make are now about to be exported from Liverpool.

In reference to a paragraph which appeared in our last Number, to the effect, that the old and respectable house of Mr. Lemuel Goddard had stopped payment, we have much pleasure in stating, that Mr. Goddard on Tuesday made such arrangements as will enable him to carry on business as usual, and that all payments will be met in due course at his bankers, Messrs. Barclay and Co.

Glasgow Pig-Iron Market.—Glasgow, March 26.—Pig-iron has been quiet but steady during this week, the business done limited, and chiefly confined to parcels for shipment. The present prices are as nearly as possible those of this day week.; viz., m. n. warrants, 53s. 6d. cash; No. 1, g. m. b., 54s. 6d.; No. 3, 53s. 6d.; No. 1, Gartsherrie, 53s. 6d. cash against bill of lading. American brands much inquired for.

America.—By the Royal Mail steamship *Cambria,* which arrived at Liverpool on Tuesday with advices from New York to the 15th, and from Boston to the 16th ult., we learn that in Scotch pig-iron very little was doing. The last sales had been made at from 39 to 40 dollars per ton, usual credit.

THE TRADES OF BIRMINGHAM.

The immense contracts on hand at Smethwick give a life and spirit to that neighbourhood not witnessed since the time when the iron and glass-work was in course of execution for the Crystal Palace. It is difficult to conceive what changes have been effected in that part of the vicinity of Birmingham by the construction of railways. Not only has there been greater facility for the conveyance of South Staffordshire manufactures, but the supply of rails, tubings, iron bridges, chairs, and every description of manufactured article connected with the construction of railways, or the make of an engine, are now the staple support of this vastly improved and improving neighbourhood.

Many tenders for the manufacture of the new copper coinage have been received in Birmingham; but it is somewhat singular that many of them are directed to parties who never had anything to do with the manufacture of copper articles; and it is not a little singular, also, that this order for a new supply of copper money should arrive in Birmingham within a week after the demolition of the old Soho mint.

The general brass-foundry business, under the peculiar circumstances in which it is placed, is doing well, but the factors are much annoyed in regulating their discounts. The hollow ware trade in West Bromwich and Willenhall is similarly circumstanced, but through the entire district, notwithstanding the annoyances and impediments to which the hardware trade is at present subjected, business is extremely active, and workpeople generally employed. An inspection of the manufacturing districts of South Staffordshire, Worcestershire, and Shropshire, during the present week, enabled one to form a pretty accurate opinion as to the condition of the population. All the works appear to be in active operation, and smiths' forges as busy, if not busier, than they have been for many years past.

Large consignments have been made during the last week of iron and brass bedsteads for Australia and California, and several emigrants from the town and neighbourhood have taken out considerable quantities of articles of domestic use and implements for digging and farming purposes. This renders the edge-tool business constantly busy, some of the manufacturers having on hand more orders for exportation than they can conveniently execute, if they are able to execute them at all.

An important improvement in the mode of banding pulleys, is now attracting much notice at Birmingham. The principle has been introduced into some large works at Liverpool, particularly at the saw-mills of Messrs. Gregson and Son, where a circular saw of 8 feet 4 inches in diameter is being worked regularly with a saving of from 20 to 50 per cent. steam power.

English Oak Timber (Navy).—A Parliamentary paper has just been issued respecting the supply of English oak timber to the Admiralty. It appears that in February, 1840, an agreement was made for 24,000 loads of timber, but reduced to 16,000, and a contract was ultimately made in 1841 for 13,812 loads; in 1843, for 20,000; in 1845, for 2,625 loads; in 1846, for 20,000; 1847, for 800 to 1,000; 1848, for 5,000; in 1849, for 940; and in 1850, for 16,500 loads.

SINGULAR ATMOSPHERIC PHENOMENA.

The following account of some curious atmospheric phenomena was communicated to the *Times* by Mr. Henry Clay, writing from Moulton, on Saturday last. Last night, almost immediately after the rising of the moon, I observed a column of light, having that luminary for its base, and extending to about 10° of altitude, clearly defined, and precisely similar to the column or pyramid of light which was so frequently seen in the clear cold dry evenings of the latter end of last spring shooting up from the sun a short time before and after its setting. This singular appearance was noticed by several correspondents in your columns. This lunar column continued visible for about half an hour, the light becoming gradually paler until it vanished; this pillar of light was perpendicular to the horizon, and its splendour but little inferior to that of the moon itself. To a person of an imaginative temperament the moon had the appearance of being "on fire," or of having been converted into an immense comet, and, in fact, it vividly brought to my recollection that of 1811. The night was very cold, and at sunrise this morning the thermometer stood 8° below freezing.—The day had been cold and stormy, and the atmosphere in a condition highly favourable for the exhibition of the phenomenon termed "looming." I had been walking with a friend to Fosdyke-bridge, at the northern extremity of this parish, at the great estuary of the Wash, when, coming in sight of the water, we were suddenly struck by the appearance of a considerable fleet, perhaps twenty vessels, lying apparently near the extremity of the fascine work now carrying on there about three miles below the bridge. The vessels were so enlarged and elevated by the effect of "looming," that, by a non-nautical man, they might have been taken for a fleet of war-frigates; and my friend, on first seeing them, jocosely exclaimed, "See! there's the French invading squadron!" The tide was running in rapidly, and the wind blowing from the N.E., the direction in which the vessels lay, while a dense black snow-storm overhung them. In about twenty minutes the snow-storm had expended itself, and the illusion vanished. The vessels were reduced to their true dimensions and distance, and proved to be a fleet of small merchant craft lying about ten miles below the bridge. This highly refractive state of the atmosphere may perhaps have had some effect in producing the lunar column mentioned above.

The British Museum.—On Monday last this interesting national exhibition was visited by no fewer than 26,537 persons, being an increase of 7,000 upon that of last year. Notwithstanding the great influx of visitors, the greatest order and regularity was observed.—*Advertiser.*

INSTITUTION OF CIVIL ENGINEERS.

SITTINGS OF MARCH 15TH AND 22ND.

Both evenings were entirely devoted to the discussion of Mr. D. K. Clark's paper "On Locomotive Boilers," Robert Stephenson, Esq., M.P., Vice-President, in the Chair.

The proceedings were commenced by an explanation of the diagrams exhibited, and by reference to examples, from the experience of Pambour and other experimentalists, in corroboration of the views propounded in the paper. The author's deductions were admitted as to the practical identity of fire-box and tube surface for evaporating action, and as to the constancy of the evaporative efficiency of fuel, whether by radiant or communicated heat, or both together, or whether the draught was mild or strong. It was considered that heat was specific and certain in its effects. Such expedients as "mid-feathers," &c., which were resorted to for specially increasing the fire-box surface, were condemned, as they were considered to be no better than tubes, while practically they were inconvenient and costly; as, among other reasons, plates of $\frac{7}{16}$ths, or $\frac{1}{2}$ inch in thickness, were employed to do the work of the tubes, which were less than $\frac{1}{8}$th inch in thickness. A practical rule followed by some engineers, and stated to be founded on extensive experience, was to allow 5 feet of heating surface for 1 foot of water evaporated per hour, and 100 feet of evaporating surface per square foot of grate. Those results were found to agree with the maximum rates recommended in the paper. It was also argued that the intensity of combustion materially affected the amount of heating surface necessary for economical evaporation, being less as the intensity was greater.

It was, on the other hand, contended that the formula, as stated in the paper, would not apply to all engines; and the following Table of actual results was given, showing the performance of various engines, several of which exhibited a greater and others a less evaporation of water and consumption of coke per square foot of grate surface per hour than the formula would have given:

Name or No. of Engine.	Total Heating Surface.	Total Firegrate Surface.	No. of Carriages.	Speed per Hour.	Actual Evaporation per Square Foot per Hour.	Evaporation by Clark's Formula.	Actual Coke Consumption per Square Foot per Hour.	Coke Consumption by Clark's Formula.	Per Centage of Difference in Water.	Per Centage of Difference in Coke.	Date, and Name of Observer.
234	1125	14·32	12·3	26·5	5·41	16·05	44·9	126·3	180	188	From March 10th to 12th, both inclusive. Mr. Alexander.
291 1st Experiment	1825·8	18·8	9	42·1	4·72	11·04	40·8	116·5	175	190	24 February— Mr. Forsyth.
291 2nd Experiment	1825·8	18·8	17	38	5·12	11·04	58·43	102·7	120	76	7 March— Mr. Alexander.
300	1133·21	23·5	34	36·4	8·21	5·16	65·5	40·37	60	62	8 March— Mr. Forsyth.
Rocket— 1st Experiment	707	10·6	9	42·1	8·99	9·89	78·4	86·2	12	10	24 February— Mr. Alexander.
Rocket— 2nd Experiment	707	10·6	13	34·5	11·9	9·89	102·3	84·4	22	21	25 February— Mr. Alexander.
Heron and Prince of Wales.	707·54	10·6	34	34·5	10·68	9·89	72·1	73·7	11	10	8 March— Mr. Alexander.

It was further argued that, from various causes, no formula could be framed to be of service, unless all the circumstances in each case were properly taken into account. As an example of the objections to long tubes, the results were given of the work done by a luggage engine on the London and North Western Railway, before and after alteration. That engine originally had tubes 14 feet long, with a total surface of upwards of 800 feet; the length of the tubes was diminished to 4 feet 9 inches, and the total surface was reduced to about 500 feet, when it was found that a saving in fuel of 40 per cent. per ton per mile moved was produced, with a saving of 23 per cent. per mile run; the coke used per ton per mile with long tubes, before alteration, being ·504 lbs., and with the short tubes ·298 lbs. The back pressure was contended to be a serious drawback to the long-tube engine, and an example was given of a trial of a single engine, on the new plan, against two of the ordinary kind, with a load of 170 tons in both cases; and although the single engine was 43 per cent. less powerful than the two engines together, and had 20 per cent. less heating surface, yet it had performed the same distance of 111 miles in ten minutes less time, and with 3 lbs. per mile less fuel. This, it was argued, was owing to the engine exerting a greater dynamic force, by being relieved from the back pressure of the blast pipe, which in the case of the other two was applied to force the fire, and to draw the heated air through the long tubes.

By placing the tube-plate some distance within the cylindrical part of the boiler, the tubes were not liable to be choked with cinders, or the draught to be obstructed. This plan also afforded an opportunity of reducing the size of the tubes from 1¾ inch diameter to 1⅝ inch, giving, in the same boiler, an equal area of flue passage, whilst at the same time the proportion of tube heating surface was increased 34 per cent. per foot of length of tube, and a very large addition of flame surface was gained. It was further argued that, although the evaporation of water per lb. of fuel was the test of the boiler, yet, up to this time, few, if any, experiments could be implicitly relied upon, owing to the quantities being estimated by measurement, instead of by weight, and without due regard to the variation of the temperature of the water in the tender.

As to the evaporative powers of marine boilers, as compared with that of the best locomotive boilers, if an investigation was instituted, it would be found that the general features of the best tubular marine boilers now used in ocean navigation were nearly identical with those of locomotive boilers, but the circumstances under which they were used were very different. In the marine boilers, coal was used instead of coke, and the natural draught of the chimney, instead of the urging of the blast-pipe in a locomotive: salt water was also used instead of fresh water, and a pressure of about 12 lbs. or 14 lbs., instead of from 60 lbs. to 80 lbs. on the square inch. Although lightness and compactness were important properties in marine boilers, they were less so than in locomotives; and the former were frequently worked for many weeks or months consecutively, without the means of stopping for any extensive repair, or even to be cleaned, except at long intervals. Under these circumstances, marine boilers required to be worked less intensely, and the water and flue-spaces must of necessity be larger, to prevent their being choked up.

The following statement showed the comparative proportions and effect of the two descriptions of boilers:

In the Locomotive Boilers.	In the Marine Boilers.
1 square foot of fire-grate consumed about 112 lbs. of coke per hour.	1 square foot of fire-grate consumed about 20 lbs. of coal per hour.
1 square foot of fire-grate required about 85 square feet of fire-box and tube surface.	1 square foot of fire-grate required about 30 square feet of fire-place and tube surface.
1 square foot of fire-grate, with the above surface, would evaporate 1008 lbs. of water per hour.	1 square foot of fire-grate, with the above surface, would evaporate 170 lbs. of water per hour.
1 square foot of flue surface would evaporate 11·7 lbs. of water per hour.	1 square foot of flue surface would evaporate 5·66 lbs. of water per hour.
1 lb. of coke would evaporate 9 lbs. of water.	1 lb. of coal would evaporate 8·5 lbs. of water.
1 H. P. of 33,000 lbs., lifted 1 foot high per minute, required about 4 lbs. of coke per hour.	1 H. P. of 33,000 lbs., lifted 1 foot high per minute, required about 4·25 lbs. of coal per hour.

From this statement it appeared that, although the proportion between the fire-grate and the flue surfaces was widely different, the quantity of water evaporated and the power obtained by the consumption of a given weight of fuel were nearly the same, when allowance was made for the difference in the evaporative power of coal and coke.

After explaining the Table of "working results," &c., it was contended, that in no case did the formula accord entirely with the practical results recorded in the Table; the nearest approximation being that of the "Rocket."

It had been found, in the altered Goods-Engine, that certain practical inconveniences arose from the horizontal transverse water tubes, and two or three mid-feathers had now been substituted for them. Intense combustion was liable to cause the formation of clinkers in the small fire-box, which did not occur in the new engine. When the drivers first took out the new engine, being unaccustomed to its peculiar action, they kept thin fires, and drew too much air through the fuel, which was wasted, by raising steam too freely; latterly, the fires had been kept thicker, and the combustion had been slower, whilst the supply of steam had been fully equal to all demands upon the engine, which, it should be recollected, had been built expressly for conveying heavy loads at high speeds, and whose performances, under these circumstances, were contended to have been among the best recorded results of the present day. To set at rest all questions as to duty performed, it was proposed to institute a set of experiments, or trials, with certain loads at given speeds; the tests to be "consumption of coke, per ton, per mile, and time of performance." The results to be communicated to the Institution.

The possible maximum evaporative power of 1 lb. of carbon, was deduced from the results of chemical experiments, showing, that 1 lb. of carbon, converted into carbonic acid, developed 14,000 units of heat, or would raise 14,000 lbs. of water through 1°, which was equivalent to the conversion of 12 lbs. of water at 60°, into steam of 120 lbs. The formula was shown to be derived directly from the tabulated results; it was a mere embodiment of results, and represented no theory. It was explained, that the formula referred to the economical evaporative power of boilers, and that it was in no way designed to limit the unconditional evaporative power; that a boiler might raise less or more steam, than the quantity assigned by the formula; but in the latter case, only by a partial sacrifice of the fuel.

In the comparative trials of the Crewe engines and the new engine, with enlarged fire-box, it was shown, that looking simply to the boilers, the Crewe boilers raised a greater total quantity of water per hour, and more water, per foot of grate, per hour, than the new boiler, with greater economy, in the ratio of 8½ lbs. per lb. of coke by the Crewe boiler to 7¾ lbs. by the new boiler. It was explained, with respect to the greater time lost by the Crewe engines on the trial, that the defect lay, not in the boilers, but in the exposed position and unprotected state of the cylinders, by which steam was condensed, and in the too large size of the chimneys, which should have been only 12 inches, instead of 15 inches diameter, and in the blast-pipe, which was carried too far into the chimney. The formula being applied to the new boiler, indicated that it could not, economically, evaporate above 120 cubic feet of water, per hour; and the correctness of this indication was confirmed by the result of eighteen experiments by Mr. Marshall, as they showed, that though 150 feet of water per hour had been evaporated, it was at a sacrifice of one-fourth of the fuel, as only 7½ lbs. were evaporated per pound of coke.

With respect to the rapidity with which the new form of boiler could get up the steam, and which was attributed to the free draught, it was shown, that the "Rocket," the first tube-boiler engine ever made, got up the steam in less time than the new boiler. The benefit of the removal of the tube-ends in the new boiler, from the direct action of the fire, was considered to be more than balanced, by the liability of the lower part of the combustion-chamber to become overheated and to be burned away, owing to the lodging of steam, at the junction with the fire-box. It was suggested, that in order to obtain better results from the new engine, the combustion-chamber should be abolished, the number of the tubes should be reduced, and their length be extended to the fire-box, which should be restricted to 16 square feet of area.

It was further argued, that in the statement of "Actual Working Results, &c.," the formula had been misunderstood and wrongly applied; for instance, in the two Crewe engines, of identical proportions, the results of the formula were stated as 86·2, 84·4, and 73·7, whereas the same results ought to have been applied to each. In No. 291 engine a similar discrepancy was apparent, the results being 116·5 and 102·7.

In the experiments themselves there were several unexplained anomalies, and in some instances, the engines, instead of working at their full power, were performing very inadequate duty, and therefore under circumstances to which the formula was not intended to apply. In the case of

the altered goods-engine, No. 125, it was urged, that in its original state, the engine must have been either in a very inefficient condition, or that its duty must have been chiefly confined to piloting, when it would have been consuming the fuel, without producing any useful effect; as a consumption of 51 lbs., or 58 lbs., per mile run, with an average train of 115 tons, was out of all proportion. That the result of the working, after alteration, viz., a consumption of 39 lbs. and 43 lbs. per mile run, with a load of 144 tons, was not favourable; as compared with the performance of a narrow gauge engine, reported on by Mr. D. Gooch, in the Gauge Inquiry; where, with a consumption of 47 lbs. per mile, a load of 294 tons was conveyed. Also, when compared with the working of the Eastern Counties goods-engines, for the last half year; where, with an average load exceeding 170 tons, the consumption of coke was only 32 lbs. per mile; taken over a distance of 529,000 miles.

A comparison was drawn between the recent experiments by Mr. Marshall, on the large fire-box engine, and those on the long-boiler engine, made during the Gauge Inquiry, the results being, with the former a consumption of 40 lbs. per mile, with an average load of 64 tons, and, with the latter, a consumption of 27 lbs. per mile, with a load of nearly 60 tons. The recorded results of the work of the passenger trains, on the Eastern Counties line, for the last half year, showed an average consumption of coke under 18 lbs. per mile run.

It was contended that, hitherto, no advantages had resulted from the extension of the fire-box and the reduction of the length of the tubes; still it was possible that this innovation might, by directing attention to the subject, lead to important modifications of the structure of locomotive boilers, which should possess compactness,—lightness,—power of raising sufficient steam, with rapidity, for performing the required work, strength to resist the chance of explosions, and a form calculated to diminish the disastrous effects of explosions when they occurred,—facility of repair, especially of the fire-box, which was the part most liable to deterioration, being most severely acted on by the fire, and also requiring more support than the tubes, the latter being, at the same time, cheaper and of thinner metal, whilst by an extension of their length, the diameter of the external shell of the boiler could be diminished; the fire-grate should not be larger than would evaporate the required quantity of water in steam, within a given time, with the utmost practical economy of fuel, and if that were accomplished, it was of little importance whether the evaporating heat was communicated through the fire-box, or by the tube surface. As to the mid-feathers, it was contended they had hitherto only served to extend the dimensions of the fire-box, and to increase the difficulties of maintaining and repairing the boiler; and that, up to the present time, the results of the experiments upon the boiler with enlarged fire-box and shortened tubes, exhibited rather a retrograde step than an onward progressive movement. In order to insure a larger attendance of members than could be obtained on Easter Tuesday, the meeting was adjourned, by special resolution, until Tuesday evening, April 5th, at 8 P.M., when the discussion on "Locomotive Boilers" would be resumed, and, if time permitted, a paper would be read "On Locomotive Boilers," by Mr. J. Sewell.

WILKINS' STENO-TELEGRAPH.

From a paper before us, headed as above, which is being extensively circulated, it seems there is at last some probability that the prices hitherto charged for telegraphic messages in England will soon have to undergo a considerable reduction in consequence of competition. In America, the reduction in the scale of charges for telegraph messages, in consequence of an active competition, has been very great. There are competing lines on every important route in the United States, except to New Orleans, by way of Savannah and Charlestown; and the effect has been on some routes to double, if not treble the business.

In 1849, when there were no competing lines between New York and Boston, the Morse line transmitted between 200 and 300 messages per day; while the daily average now on the three lines is nearly 600. The tariff on these lines has been reduced from 50 to 20 cents. per 10 words. Between New York and Philadelphia, where there are now three lines, each of them does more business than when one only was in operation, although the original rates are unchanged.

Mr. Wilkins, after more than eight years' experience in the erection and management of telegraphs in this country and in the United States, has invented, and obtained protection for a telegraph of extreme simplicity, requiring only one wire; writing a shorthand alphabet on paper, not previously prepared, and forming characters representing letters, joined by a line in an unvarying position, which will prevent the mistakes so frequently occurring with telegraphs depending upon alphabets of dots, lines, and spaces; as the space-character is often mistaken for the space dividing one word from the other. It now rests with those who

are interested in the cheapening of rates for telegraphic messages to see into it; for Mr. Wilkins says, "he is prepared to show that the rates here named for messages by the steno-telegraph are ample to ensure a very profitable return for capital used, the rates being 1s. for 20 words under, and 1s. 8d. for 20 words over, 100 miles; additional words 1d. each. Newspaper dispatches, any distance, ½d.; and 1d. per word, according to time."

THE CALORIC SHIP "ERICSSON."

The following account of the return of the "Ericsson" to New York occurs in the *Times'* New York letter, brought by the last mail:—"The caloric ship 'Ericsson' had arrived at New York from her experimental trip to Alexandria, &c. Her engine worked throughout the passage with perfect regularity, and the vessel proved herself in every respect seaworthy. The 'Ericsson' left Alexandria on Friday night. She carried at no time more than 7½ pounds pressure to the square inch, which is about 3½ less than she is capable of carrying."

DESIGNS ACT EXTENSION BILL.

The following is a copy of the Bill to extend the Designs Act of 1850, and to give protection from piracy to persons exhibiting new inventions in the Great Industrial Exhibition of 1853. It has now passed the House of Commons, into which it was introduced by Lord Naas and Mr. Napier, and will soon pass the Lords:

Whereas it is expedient that such protection as hereinafter mentioned should be afforded to persons desirous of exhibiting new inventions in the Great Industrial Exhibition of 1853, in connection with the Royal Dublin Society, to be held in Dublin: Be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

I. Any new invention for which Letters Patent might lawfully be granted may at any time during the year 1853, but not afterwards, be publicly exhibited in any place previously certified by the Lords of the Committee of Privy Council for Trade and Foreign Plantations to be a place of exhibition within the meaning of this Act and of the Designs Act, 1850, without prejudice to the validity of any Letters Patent to be thereafter, during the term of the provisional registration hereinafter mentioned, granted for such invention to the true and first inventor thereof: Provided always, that such invention have previously to such public exhibition thereof been provisionally registered in manner hereinafter mentioned; and provided also, that the same be not otherwise publicly exhibited or used by or with the consent of the inventor prior to the granting of any such Letters Patent as aforesaid, except as hereinafter mentioned: Provided also, that no sale or transfer, or contract for sale or transfer, of the right to or benefit of any invention so provisionally registered, or of the rights acquired under this Act, or to be acquired under any Letters Patent to be granted for such invention, shall be deemed a use of such invention; and the publication of any account or description of such invention in any catalogue, paper, newspaper, periodical, or otherwise, shall not affect the validity of any Letters Patent to be during such term granted as aforesaid.

II. The public trial or exhibition of any such invention as aforesaid (being an invention for purposes of agriculture or horticulture), which shall be certified by the lords of the said Committee to have taken place under the direction of the Committee for the said exhibition of 1853 for purposes connected with the exhibition thereof in such place of public exhibition as aforesaid, whether such trial or exhibition take place before or after the passing of this Act, shall not prevent the provisional registration of such invention under this Act, nor prejudice or affect the validity of any Letters Patent to be granted for such invention during such term as aforesaid.

III. Her Majesty's Attorney-general, or such person or persons as he may from time to time appoint to issue certificates under this Act, on being furnished with a description in writing, signed by or on behalf of the person claiming to be the true and first inventor within this realm of any new invention intended to be exhibited in such place of public exhibition as aforesaid, and on being satisfied that such invention is proper to be so exhibited, and that the description in writing so furnished describes the nature of the said invention so intended to be exhibited, and in what manner the same is to be performed, shall give a certificate in writing, under the hand or hands of such Attorney-general or the person or persons appointed as aforesaid, for the provisional registration of such invention.

IV. The Registrar of Designs acting under the Designs Act, 1850, upon receiving such certificate, and being furnished with the name and place of address of the person by or on whose behalf the registra-

tion is desired, shall register such certificate, name, and place of address, and the invention to which any certificate so registered relates, shall be deemed to be provisionally registered, and the registration thereof shall continue in force for the term of one year from the time of the same being so registered, and the registrar shall certify, under his hand and seal that such invention has been provisionally registered, and the date of such registration, and the name and place of address of the person by or on whose behalf the registration was effected: Provided always that if any invention so provisionally registered be not actually exhibited in such place of public exhibition as aforesaid, or if the same invention be in use by others at the time of the said registration, or if the person by or on whose behalf the said registration has been effected be not the first and true inventor thereof, such registration shall be absolutely void.

V. The description in writing of any invention so provisionally registered shall be preserved in such manner and subject to such regulations as the Attorney-general shall direct; and any invention so provisionally registered, and exhibited at such place of public exhibition as aforesaid, shall have the words "provisionally registered" marked thereon or attached thereto, with the date of the said registration.

VI. Such provisional registration as aforesaid shall, during the term thereof, confer on the inventor of such invention, with respect thereto, all the protection against piracy and other benefits which, by the Designs Act, 1850, are conferred upon the proprietors of designs provisionally registered thereunder with respect to such designs; and so long as such provisional registration continues in force, the penalties and provisions of the Designs Act, 1842, for preventing the piracy of designs shall extend to the acts, matters, and things hereinafter mentioned, as fully and effectually as if those penalties and provisions had been re-enacted in this Act, and expressly extended to such acts, matters, and things; that is to say, to the making, using, exercising, or vending the invention so provisionally registered, to the practising the same, or any part thereof, to the counterfeiting, imitating, or resembling the same, to the making additions thereto or substraction from the same, without the consent in writing of the person by or on whose behalf the said invention was so provisionally originally registered.

VII. All Letters Patent to be during the term of any such provisional registration granted in respect of any invention so provisionally registered shall, notwithstanding the registration thereof, and notwithstanding the exhibition thereof in such place of public exhibition or otherwise as aforesaid, be of the same validity as if such invention had not been so registered or exhibited; and it shall be lawful for the Lord High Chancellor, if he think fit, on the grant of any Letters Patent to any inventor in respect of any invention provisionally registered under this Act, to cause such Letters Patent to be sealed as of the day of such provisional registration, and to bear date the day of such provisional registration, the Act of the eighteenth year of King Henry VI., or any other Act notwithstanding.

VIII. Notwithstanding anything contained in the Designs Act, 1850, and the two Acts therein referred to, and called the Designs Act, 1842, and the Designs Act, 1843, the protection intended to be by those Acts extended to the proprietors of new and original designs shall be extended to the proprietors of all new and original designs which shall be provisionally registered and exhibited in such place of public exhibition as aforesaid, notwithstanding that such designs may have been previously published or applied elsewhere than in the United Kingdom of Great Britain and Ireland; Provided that such design, or any article to which the same has been applied, have not been publicly sold or exposed for sale previously to such exhibition thereof as aforesaid.

IX. All the provisions of the Designs Act, 1850, and the provisions incorporated therewith, relating or applicable to the designs to be provisionally registered thereunder, or to the proprietors of such designs, except the provision for extending the term of any such provisional registration, shall, so far as the same are not repugnant to or inconsistent with the provisions of this Act, apply to the inventions to be provisionally registered under this Act, and to the inventors thereof; and the said Designs Act and this Act shall be construed together as One Act.

X. This Act may be cited as "The Protection of Inventions Act, 1853."

POLYTECHNIC INSTITUTION.

With the very praiseworthy intention of turning the Easter holidays to profitable account in an educational point of view, the Directors of the Polytechnic Institution have prepared a highly instructive and interesting series of illustrated lectures in some of the most attractive branches of experimental philosophy; and it is gratifying to observe that these have been attended

by very large numbers of the holiday folks. During the past week, this great school of the sciences has consequently pursued its work of instruction with a degree of vigour and success extremely pleasing to those who are favourable to intellectual cultivation, and creditable alike to the Institution itself, as an intellectual centre, and the gentlemen who so ably discharge in its spacious theatres the important functions of popular professors.

Mr. J. H. Pepper's lectures "On Ancient and Modern Chemists," have attracted considerable notice, and excited a corresponding degree of interest. Those who have had any experience of the effective manner in which this gentleman develops the most recondite principles of science, and their application to the great processes of art and manufacture which we witness in constant action around us, will be able to form an estimate of the impression which in these lectures he was able to make on the minds of his auditory. The subject was judiciously chosen to exhibit the gradual progress of the science of chemistry, from the rude and mystified processes of the alchemists in which it took its birth, down to the broad daylight of our own philosophy. In his hands, the exposition of this comprehensive subject was a pleasing and popular essay, highly instructive in its immediate objects, and also in its collateral historical associations. His illustrations, too, were numerous, and all of them well chosen with reference to the points under consideration, as he reached them successively.

Dr. Bachoffner's lectures "On the Mechanical Properties of Aëriform Bodies" were also productive of much instruction and interest; the relation of the principles expounded to various arts and sciences being fully and successfully shown. In addition to these points of high scientific interest, Mr. Crispe has been continuing his lectures on the principle of construction involved in the caloric engine of the *Ericsson*, a subject the explanation of which was followed with deep attention by his numerous hearers.

We may observe, in conclusion, that the merits of the Polytechnic Institution, as a depository of the works of science and of art, are being well maintained by the intelligence and enterprise of its Directors, who appear to spare neither expense nor pains to add to their great store of scientific objects. A large photographic school is in course of organization, among other matters, and the optical and other popular exhibitions constantly going forward are being added to and increased in their efficiency. In a short time we hope to be able to give our readers a detailed account of some of these great alterations, and, in the meanwhile, it affords us real satisfaction to know that the educational influence of this noble Institution is extending itself to all classes of society, and very much encouraging the study of natural philosophy, which this country is now making such vigorous and such meritorious endeavours to promote.

THE GREAT GLOBE, LEICESTER-SQUARE.

By successive additions to the original scope of the objects contemplated by Mr. Wyld in this noble structure, it has now become a great geographical museum, and a centre of geographical knowledge worthy, by the vast extent of its appliances, of the elevated position which this country holds in the scale of nations. The great concave globe of 60 feet diameter, upon the surface of which the physical aspect of every land has been modelled with an accuracy that has cost an infinite amount of research into all the authorities, and an extreme refinement of processes in the representation of the several sections according to scale—the great globe now forms only a portion—though certainly a grand and beautiful one—of the lofty purposes of science which are administered to in this remarkable building. Of this we have recently had some important proofs, which have been recognised with much gratification by our scientific communities. The great project of the Darien Ship Canal, upon which such momentous commercial operations depend, has here received an illustration which could not otherwise be afforded, and the physical phenomena of our planet are most successfully made apparent for instruction and study. As a great theatre, indeed, for the study of geopraphy in all its aspects, and of its numerous collateral sciences, with their infinitely varied application in the arts of life, this establishment must be regarded as an invaluable acquisition to the progress of science. The entire range of these subjects is here developed in globes, maps, and books, which Mr. Wyld's ardent devotion to them, and the facilities afforded by his professional occupations have enabled him to produce and collect. Around the lower part of the exterior of the globe is a spacious corridor, with rich arabesque decorations, literally filled with books, maps, charts, surveys, and duplicate casts of the various portions of the great concave model. Several rooms open out of this corridor, which are devoted to peculiar subjects of illustration. In one of them is a segment of the north portion of a globe of about 12 feet diameter, con-

taining the north pole, and the 50th parallel of north latitude. This is an exceedingly beautiful model, conveying at a glance an accurate knowledge of the Polar Sea, and the region in which the unfortunate Sir John Franklin conducted his explorations. Models on a large scale, of particular tracts of land—one of Darien among the rest—to which attention is now directed—are also exhibited here, for illustration and study. A very fine collection of minerals, arranged according to their geological genera and classes, forms part of this enormous and valuable repository, and will be enriched by an extensive collection of specimens of gold and gold ores, of which Mr. Wyld has already some very valuable o·es in his possession. He has also commenced a collection of costumes towards an ethnological museum, of which he has already purchased 1,200, and means to purchase examples of the entire range, extending throughout the world, it is supposed, to 17,000 varieties. An extremely valuable collection of the maps published in all countries, from the most ancient times, is arranged in drawers and book-cases, according to a simple distribution of countries around the exterior of the globe, readily accessible for reference.

The model itself has recently undergone a minute revision in certain regions, and a few additions have been made to it, bringing its character for recentness to the level of our present state of geographical knowledge, as improved by the last surveys. This important work has been effected with a reference to the last Admiralty surveys, and upwards of 400 charts collected from the most celebrated libraries and museums of Europe. Thus this great work represents, with critical accuracy, the actual configuration of the surface of our planet, as ascertained from a minute comparison of the best authorities. Of the vast labour of such an undertaking, and of the great difficulties of constructing a concave globe of sixty feet in diameter, it is unnecessary that we should now speak; but we may observe in passing, that a very large number of the most prominent altitudes have been tested by means of the photometric process. When it is considered that the surface of the land on this globe, upon which the work of the modeller and of the geographer has been expended, amounts, in round numbers, to 4,000 square feet, and that the general work up to this time has involved an outlay of 45,000*l*., our readers will probably form a high estimate of the superior merits of this beautiful object in a scientific point of view. The globe has recently undergone re-colouring (not yet completed,) which, besides exhibiting the geographical features of the surface,—such as continents, oceans, rivers, mountain-chains, islands, lakes, &c.—has been happily made to embrace a new and important feature. The colouring has been so managed as to indicate the range of vegetation, and, in some instances, the classes of vegetation which prevail, thus rendering the globe subservient to some of the purposes for which physical atlases are usually published. Glancing at the variegated surface thus produced, and of which, being concave, the eye is enabled to embrace at once a vast extent, we have before us a correct picture of the general character of the scenery and of the vegetation in each country. The impression on the mind which this combination of circumstances produces is deep and lasting, and cannot fail of proving eminently beneficial in inculcating a taste for the study.

Among other subjects of illustration collected here, are models of a few districts in which engineering operations are going forward, or are contemplated. The metropolis, on a large scale, is one element in this series. A very large model of the surface and thoroughfares of the metropolis has been completed, which is eminently useful in its illustration of the subject of drainage, and that, also, of the character for salubrity of each portion of the town and its neighbourhood. Mr. Wyld contemplates exhibiting on this model the geological nature of the soil in each part, which will still further improve its value; and he is about to make great numbers of these models in *papier maché* for publication. They will be framed, and form very important aids for instruction and study.

In the present state of the sciences, we consider that Mr. Wyld has done immense service in giving to that of physical geography so great a public prominence, and in providing so many and such valuable facilities for its study. For this reason we have felt a pleasure in calling attention to these new features of the world-wide famous establishment in Leicester-square; and we have only to add our hope that the great enterprise of that gentleman, and his earnest desire to promote the study of science by the initiated, and the spread of instruction among the young, may meet with the substantial and honourable reward which they deserve.

NEW DESCRIPTION OF STEAMER.

On Wednesday a new description of steamer, called "The Rotatory," commenced to ply on the Clyde, between Glasgow and Dumbarton. The peculiarity of her construction lies in her compactness, her paddles being much lower than the bul-

warks; and as her engine is on the rotatory principle, it likewise occupies very little space. The inventor, Mr. David Napier, thus describes her:—"The advantages these engines have over others are that they are more compact, consume about one-fourth less fuel, and require no engineer; the steersman, by a peculiar valve, moves the vessel ahead or astern, without communicating with any one. The furnace-bars contain water, consequently the hot ashes, which are destructive to the common furnace-bar, in this case tend to the production of steam. There is also a simple application of the fan to assist combustion. Such steamers would be invaluable on crowded rivers like the Thames or Clyde, as running down could scarcely ever happen, the steersman standing before the funnel, and there being no paddle-boxes to interrupt his view, he sees every object ahead, and can stop or reverse the engines in an instant, without leaving the wheel, or applying to any second party." — *Glasgow Courier.*

FORDER'S PATENT RAILWAY FENDER.

We copied from *Aris's Gazette*, into our Magazine of the 13th November last, a description of this invention, and of its success when applied to model carriages upon a small rail. We have been informed by the patentee, Mr. Forder, that the merits of the invention were tested upon a large scale on the 14th ult., in the presence of a few friends, and about fifty other observers.

Having obtained leave from the manager of the Clay-cross colliery to run a coal-truck down a railway incline of 1 in 18, against another truck, with the understanding that he should pay for all damages consequent upon the experiment, and 10*l.* for each carriage broken, the patentee had two fenders made, one for each carriage, which were respectively fastened upon the cross beam of the frames. One of them was loaded, and, including the wagon, weighed 3 tons 3 cwt. This was drawn up the incline 750 feet; the other was placed at the bottom of the incline, and blocks were placed across the rails against the wheels to make it firm. The wagons were old, and had not been in use for some time, and were by no means strong. They were north-country wagons, and the gauge of the rail was rather too wide for the wheels, so that in moving them to their stations they repeatedly got off. The bottom wagon weighed, including the load, between 4 and 5 tons. At a given signal, the wagon at the top of the incline was let go, and with gradually-accelerated speed ran down the incline against the bottom wagon,—having attained at the moment of collision a speed of from 20 to 30 miles an hour, according to calculation. The moving-carriage fender struck the other, and both were driven right home, without comparative injury to the wagons; the latter were driven off the rails a few yards distance. The fenders were made for the wagons, and not of a shape or size proposed for passenger or other carriages. They were respectively 2 feet 4 inches long by 10 inches broad, and had each 27 apertures and strikers. Over each aperture were fixed three pieces of steel-plate, 3 inches by $1\frac{1}{2}$. Two of them were 13 wire gauge, and the other $\frac{3}{16}$ths of an inch thick; the apertures were 2 inches square. The whole of the plates, that is, 54 of the $\frac{3}{16}$th thickness and 108 of the 13 wire gauge, were driven through the apertures, some bent 1 inch, and others broken.

The calculated resisting power of the fenders was 2 tons, travelling 20 miles an hour; but the moving wagon was loaded with another ton, to prevent its getting off the rail; and accordingly the collision was greater than the resisting power, and the surplus blow was received by the wagons, causing them to move off the rail. This experiment clearly showed the principle of this invention to be correct, and that fenders of this description may be made of sufficient resisting power for any weight and speed, so as to absorb the injurious effects of any collision.

The fenders are not intended to prevent collisions, but to render them harmless, and thus save life and prevent injury to passengers and carriages.

An Elementary Course of Mathematics, prepared for the Use of the Royal Military Academy (Woolwich), by Order of the Master-General and Board of Ordnance. By John F. Heather, Esq., M.A. John Weale.

The necessity now so deeply felt, and so strenuously insisted upon, of extending the study of the arts of construction with reference to the principles of science upon which their successful practice proceeds, will insure a cordial welcome to the admirable volume before us. Comprehending in its ample scope the entire range of these principles, exhibiting in an eminently elegant manner their mathematical applica-

tion to produce the best practical results, and illustrating each analytical process by a very extensive collection of interesting examples, a large proportion of which have here met our eye for the first time, the author has done an inestimably valuable service to the cultivation of this portion of the exact sciences,—probably the most important in their influence on the economy of life.

That the study of natural philosophy in England has not been prosecuted to an extent commensurate with the magnitude of her mechanical and engineering works, and the fair prospect of their vigorous development is a circumstance which has been long known to those who have had opportunities of witnessing the extremely limited operation of our academical systems, for the adequate education of the engineering community. It remained, however, for the great international comparison which occurred in the year 1851, to show us how little care we had taken, up to that eventful period, to promote the studies necessary to their professions. Whether this neglect was attributable to the circumstance of this important branch of education having been almost entirely left to individual or local exertion, or to a reliance upon the vast resources of our country, which, to a great extent, superseded the necessity for their scientific economy, the conclusion has been unwillingly recognized, that, as a general rule, our mechanical works have evidenced a lamentable disregard of mechanical principles. This want of a philosophical disposition of parts has been noticed by several writers on the various sections of the Exhibition, particularly by Professor Moseley on the hydraulic machinery; and, considering the high character of machine-making in England, it is only this cause by which we can explain the surprise of our manufacturers at finding themselves approached, and sometimes even surpassed, in what they had come to regard themselves as the possessors of an hereditary superiority. In his "Lectures on the Results of the Great Exhibition," Dr. Lyon Playfair has developed this subject with a clearness that leaves us no retreat from this view of it, were it not otherwise evident. Our eyes having been thus opened, however, to our deficiency in fundamental studies, we have not been slow to organize means for their extensive cultivation. During the interval that has since elapsed, the Government have taken the initiative in this great work, by establishing schools having in view the improvement of the great industrial arts. The re-organization of our schools of design and of ornamental art, the school of mines and of applied science, the school of practical geology, the schools of engineering and of agriculture, and others that might be mentioned, are the results of the conviction which has thus forced itself upon the minds of the observant.

The part which the Government has taken in this great intellectual movement is the more creditable on account of the peculiar embarrassments which surround the general question of education, and the new stimulus it has given to practical studies in the great national seminaries under its own control. The "Course of Mathematics," written by Mr. Heather for the Royal Military Academy at Woolwich, is, as its title-page sufficiently indicates, a highly gratifying illustration of this circumstance, which we feel a peculiar pleasure in calling attention to. A glance at its pages will serve to show that the study of the mathematics in their application to the military art, which might have been supposed to be its main object, has received no undue prominence, but has been kept in subordination to the general development of subjects embraced by the principles of mechanics, hydrostatics, hydrodynamics, and pneumatics. A step so admirably devised by the Board of Ordnance for encouraging the accurate study of every class of work depending upon these branches of physical science, has received full effect from the perfect manner in which they have been treated by the author. As in other treatises having a similar object in view, he presupposes a competent knowledge of analytical operations,—those of algebra, trigonometry and the differential and integral calculus; but upon that basis he may be said to have constructed a mode of developing the subject which mathematical readers will be certain to appreciate, and which recommends itself by a remarkable degree of originality; a profusion of examples suggested by a close observation of cases occurring in various mechanical occupations, besides those which belong more strictly speaking to natural philosophy; and lastly, by the great practical utility of the rules investigated, and tables furnished, for an immense variety of purposes.

The statical portion of the subject is divided into two portions; the first treating of the general theory, which it explains much more in detail than the University text-books, which assume the assistance of a tutor. In the second part are developed the principal of the causes which vitiate in most instances the deductions of theory. The laws of friction, the resistance to rolling, the stiffness of ropes and chains, the strength of materials, and the principles of construction, with their application to roofs, arches, suspension-bridges and revetments, are severally investigated in a

plain and elegant manner, every way suited to the requirements of actual practice. On the dynamical portion of his work the author appears to have bestowed considerable pains, and the result of his labours has been to place that more subtle branch of mechanical science equally within the reach of the student, which is an object of considerable importance. His investigation of the differential equations of velocity and force, will be read in particular with great interest. The famous principle of D'Alembert, is minutely explained and stated in its various forms, accompanied by such illustrations as will render easy its application to any system of matter in motion. All the great subjects of dynamical analysis — oscillation, the various centres, the principles of the conservation of the *vis viva*, and of the motion of the centre of gravity, the principle of least action, and the units of work accomplished in various combinations of human and animal labour, — all these receive minute attention, are illustrated by numerous examples which are worked, or of which the answers are given, and are accompanied by tables on the authority of Desaguliers, Barlow, Poncelet, and other eminent men.

The hydrostatics and hydrodynamics are treated equally in detail, while the solutions of the ordinary philosophical problems occurring in these sciences is effected in a manner far more simple than that of Miller, Moseley, and some other writers. A collection of no fewer than 150 problems concludes the book, a large proportion of which are new, and which exercise the student in the combined application of all the processes. For facilities of study, in short, this course combines, in an eminent degree, the advantages in point of sufficiency and clearness of explanation which distinguish the works of Boucharlat, Biot, Poisson, and other French mathematicians of note, with those of our own school in the number, excellence, and originality, of its examples, the study of which alone can give to the student the complete command of this powerful analytical engine, so essential to the maintenance of our ascendancy in the arts.

It only remains for us to say, after a minute investigation of these characteristics of M. Heather's work, that he has given a strong impulse to the cultivation of this grand science, and has employed with great effect the experience he has acquired as a master in the Royal Military Academy, to inculcate a love for it, and to render its acquisition immediately available for practical purposes of the highest order of public utility.

Industrial Instruction in England. A Report made to the Belgian Government. By the Chevalier de Cocquiel. (Translated into English by Peter Berlyn.) Chapman and Hall.

The great question of national education has of late years forced itself universally upon public attention; and, like other questions which arise from the natural progress of things, must continue to occupy that attention until its requirements are fully understood, recognised, and provided for. On reviewing the general state of the question, the first consideration which suggests itself to us is, what are the extent and nature of our deficiencies? And we think this consideration involves by far the greatest difficulty incidental to the subject. We find opposed to it a pretty general ignorance of the true state of other populations and governments, and by no means a clear view of our own, in relation to this important matter; while the endless disputes as to what ought, and what ought not to constitute national education, threaten not only to paralyse all practical measures if propounded, but what is worse, at the outset, to preclude all rational and unprejudiced inquiry, upon which, and upon which only, can any general and comprehensive system be soundly based.

The Report now before us, seems, therefore, to make a very opportune appearance. It deals, it is true, with but a part of a great whole, but that part is a most important one, and in an industrious community, such as ours, more readily appreciable than any other portion of the subject; and we are of opinion that Mr. Berlyn has done a most essential service in presenting, in an English garb, the candid opinions of so profound and efficient an observer as M. de Cocquiel, to the parties the most interested, —the British public.

We have read the Report with much pleasure, and have risen from the perusal certainly much instructed. It contains more than enough of eulogy to gratify our national pride, while it is not at all sparing of its strictures wherever the state of things requires them. As the Report was originally written for the use of the Belgian government, without any view to publication in this country, it may be taken for granted that it is in all respects a fair and candid statement of the author's opinions, and as far as we are able to judge, he has availed himself to the utmost of the various sources of information which perhaps in this country

are more at the command of the foreign inquirer than in almost any other. There is scarcely any one of our great branches of manufacturing industry, the organization of which might not be immensely benefited by giving practical effect to the opinions and considerations here submitted. The reader will find many facts collected, some of which have not been insisted upon with much stress, but of which the author of the Report has had opportunities of understanding the importance in his own country. His conclusions are eminently practical, and a philosophical tone of reflection pervades the book, which necessarily imparts to it the character of a high authority upon this important question.

We have only to add, in conclusion, that the work of translation has been accomplished at once with great elegance and precision of effect. Largely acquainted himself with very many important sections of the industrial communities of this, and of certain continental countries, the task could not have been assigned to better hands than to those of Mr. Berlyn, or have been discharged in a manner more worthy of its public importance. Its value for all practical purposes has been greatly enhanced by the notes which he has occasionally added; and those who are acquainted with the great merits of his "Popular Narrative of the Great Exhibition," will be ready to do justice to their practical utility.

The Sydenham Sunday; its Good Promise, and why so Needful. By J. DACRES DEVLIN, a Shoemaker. Saunders and Stanford.

THIS is a little *brochure* of humble pretensions but considerable merit, in which the author successfully puts forward the feelings of intelligent working men on the Sydenham Palace Sunday question, with which he is well known to have ample opportunities of being acquainted, and examines deferentially, but candidly, the propositions which have been made to compromise antagonistic exertions. Having already expressed our strong and unalterable desire that the working man should be able to instruct himself on the Sunday in this great school of Nature and of Art, as well as recreate his physical frame by relaxing from toil, it is almost superfluous for us to commend Mr. Devlin's pamphlet to consideration. It will serve admirably to direct the thoughts of the working-classes fairly and freely to all the great bearings of the question; and men of higher callings may profit something by its perusal. The production is highly creditable to a man in his position; and while we hope it may exert a beneficial influence on the settlement of the question, so far as the working-classes are concerned, we sincerely trust that its author may meet with some suitable reward.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MARCH 28, 1853.

JAMES WARREN, of Montague-terrace, Mile-end-road, and BARNARD PEARD WALKER, of North-street, Wolverhampton. *For improvements in the manufacture of screws and screw-keys, and in the construction of bridges applicable to floorings, roofings, and paving.* Patent dated September 18, 1852.

1. The improvements relate to the manufacture of cast screws, and consist in a modified arrangement of an apparatus for this purpose previously patented by Mr. Warren, in combination with the adaptation thereto of means of cutting the nicks, and grinding and polishing the heads of screws. The improvements consist principally in using guide-screws of finer pitch than the pattern-screws, and in compensating for this difference in pitch by causing the screwed guide-plate to be lowered so as to approach the moulds, instead of being stationary.

2. The improved screw-key is constructed with one of the jaws working on a swivel-joint or pivot, in connection with tension and compression-bars, which receive the strain thrown on the jaws when turning a nut or bolt.

3. For constructing the flooring of bridges and for paving, the patentees employ plates of metal or other material, dovetailed together at their edges, and held together by tension-rods passing through studs on their under sides. They also use square plates of iron, bent at right angles on the diagonal line, and then placed in pairs, with metal strips between their edges, the triangular portions underneath being riveted together, and the whole structure supported by tension-rods, by which arrangement the use of girders may be dispensed with.

JOHN MICHELL, of Calenick, Cornwall. *For improvements in purifying tin ores, and separating ores of tin from other minerals.* Patent dated September 18, 1852.

This invention consists in a mode of applying common salt for the purpose of purifying tin ores, and separating therefrom the other metals with which they are usually associated.

Before proceeding to operate, and in

order to ascertain the proper proportion of salt to be used, the patentee takes 8 oz. samples of the tin ore, previously stamped and washed, and submits them in mixture with different proportions of salt (say 1 or 2 ozs.) to a temperature of about 163° of Daniell's pyrometer, for about three-quarters of an hour, using a reverberatory or other furnace. If on analysing the oxides thus produced, either sample is found to be pure, then the quantity of salt used in calcining that sample is a proper proportion to be used.

The ores, previously stamped and washed, and salt are mixed together, and placed in a reverberatory or other furnace, where they are subjected for three to four hours to a heat of 163° of Daniell's pyrometer, which should be raised gradually, but not exceeded, the object being not to decompose the oxide of tin, but to cause the chlorine of the salt to combine with the other metals present, so as to render them soluble in water. At the conclusion of the roasting, the ore is thrown into water and washed; after which it is smelted in the usual way.

Claim.—The mode described of applying common salt for purifying tin ores, and separating ores of tin from other minerals.

Moses Poole, of London, gentleman. *For improvements in combining caoutchouc with other matters.* (A communication.) Patent dated September 18, 1852.

This invention, which is a communication from Mr. Goodyear, of New York, consists in producing a new compound of caoutchouc by combining therewith a product of coal-tar and sulphur, alone or in combination with metals and other substances used in manufacturing compounds of caoutchouc.

The product referred to is obtained by heating coal-tar in an open boiler until it acquires a consistency about equal to that of rosin, and it is mixed with the caoutchouc in proportions which may vary according to the character of the material to be produced. The sulphur or compound thereof is used for the purpose of vulcanising the material, which operation is performed by the application of heat in the ordinary manner.

Claim.—The combining of a product of coal-tar and sulphur with caoutchouc, and subjecting the same to heat.

James Pillans Wilson, of Belmont, Vauxhall, gentleman. *For improvements in the manufacture of cloths, and in the preparation of wool for the manufacture of woollen and other fabrics, and in the preparation of materials to be used for these purposes.* Patent dated September 18, 1852.

The *first* part of this invention consists in depriving oleic acid of the objectionable smell at present distinguishing it, and thereby rendering it better adapted for being used in the woollen manufacture as a lubricant, &c. This smell would appear to be dependent on the presence of a volatile matter in the oleic acid, which Mr. Wilson drives off by heating the material by means of steam in a boiling vat, keeping the temperature at 400° Fahr. for about two hours, and then gradually introducing cold water to cool it down, in which state it is fit for use in place of oil.

The *second* part of the invention consists in employing in the woollen manufacture, in place of soap, the saponaceous matter resulting from the combination of an alkali with distilled oleic acid, whether obtained from palm or other oil. In producing the new compound, Mr. Wilson employs a solution of soda-ash rendered caustic by quicklime, in water in the proportion of half a pound of soda-ash to one gallon of water, and then adds thereto a pint of oleic acid, stirring the mixture till the combination of the ingredients is effected. This soapy matter may be used in milling or fulling and in washing wool.

Claims.—1. The application in the manufacture of cloth, and in the preparation of wool for the manufacture of woollen and other fabrics of oleic acid subjected to a preparatory process for preventing smell. Also the subjecting of oleic acid to such preparatory process for the purpose of such application.

2. The application in place of soap of distilled oleic acid combined with alkali in the manufacture of cloths, and in the preparation of wool for the manufacture of woollen and other fabrics.

George Hutchison, of Glasgow, merchant. *For a method of preparing oils for lubricating and burning.* Patent dated Sept. 18, 1852.

This invention consists in imparting additional fluidity to lard or tallow-oil, and oils of a naturally viscid character, by combining with them oleic ether, so as to give them a character resembling that of sperm-oil, and render them better adapted for lubricating and burning.

The oleic ether is found to produce the best effect when used in the proportion of one part to two parts of neutral tallow-oil, which, however, may be varied, and the oleates used may be those of the oxides of ethyle or of methyle, or of the other bases of the alcohols. The patentee describes a process for preparing the oleic ether from the ingredients usually employed. The improvements introduced by him in conducting it consist in combining a worm or condenser with the digester, in order to intercept the ethereal and alcoholic vapours evolved, and in adding fresh quantities of sulphuric acid as the process proceeds, in order to maintain the acid at a suitable strength. The oleate produced in this

manner is washed in an alkaline solution previous to use.

Claims as above.

JOHN MACINTOSH, of New-street, Surrey, civil engineer. *For improvements in manufacturing and refining sugar.* Patent dated September 18, 1852.

Mr. Macintosh's improvements consist in placing evaporating pans used in the concentration of saccharine fluids in chambers or stoves, the air of which is heated by any convenient means to such a temperature as to cause the evaporation of the fluids. A current of air is caused to circulate through the chamber, so as to carry off the aqueous vapours evolved, and the fluids are raised by endless bands passing under and over rollers in and above the pans, so as to expose an extended surface to the action of the heated air; or they are caused to flow slowly down the surfaces of metal plates, the lower extremities of which dip into the pans. When sufficiently concentrated, the solutions are treated in the manner usually followed in the manufacture of sugar.

Claim.—The mode described of evaporating and concentrating saccharine fluids in the manufacture and refining of sugar.

PROVISIONAL PROTECTIONS.

Dated February 25, 1853.

482. John George Taylor. Improvements in ornamental fastenings for dress.

Dated March 1, 1853.

510. William Edward Newton. Improvements in capstans. A communication.

Dated March 3, 1853.

532. Robert Barclay. Improvements in rotatory engines for obtaining motive power, and for transmitting aëriform bodies and fluids.

Dated March 9, 1853.

595. Samuel Blackwell. Improvements in saddlery and harness.

596. François Valtat and François Marie Rouillé. Improvements in the construction of the combs of looms for weaving.

597. Joseph Shuttleworth. Improvements in appendages to portable machines for thrashing, shaking, and winnowing corn.

599. George Chambers. Improved means of gathering cinders and depositing ashes under fire-grates, securing economy in fuel and cleanliness of appearance.

601. George Collier. Improvements in the manufacture of carpets and other fabrics.

603. Henry Ransford. Improvements in the manufacture of starch.

605. George Collier and Samuel Thornton. Improvements in spinning, roving, doubling, and twisting cotton, worsted, flax, and other fibrous materials.

606. Frederick William Campin. An instrument for measuring the steerage way of vessels and the rapidity of currents of water and air, applicable to ventilating ships and railway carriages. A communication from Messrs. Overduyn and Droinet.

Dated March 10, 1853.

607. James Walmsley. Improved machinery and arrangements for block-printing.

608. John Powis and Jabus Stanley James. Improvements in machinery for slotting, tenoning, morticing, grooving, drilling, boring, and vertical planing.

609. Edward Taylor Bellhouse. Improvements in iron structures.

610. Thomas Butler Dodgson. Improvements in roads or ways, pavements, and footpaths generally.

611. George Collier. Improvements in machinery or apparatus used in weaving.

612. The Hon. William Erskine Cochrane and William Marshall Cochrane. Improvements in girths or pads for retaining saddles in their places.

613. François Frederick Dumarchey. Certain improvements in making roads and ways.

614. James Stevens. Improvements in apparatus for facilitating communications between the guard and engine-man of railway trains.

615. Emanuel Myers. Improvements in preventing railway engines and carriages running off the rails.

Dated March 11, 1853.

616. Francis Preston. Improvements in the manufacture of bobbins and spools.

617. James Summers. Improvements in certain kinds of sails.

619. Moses Poole. Improvements in apparatus for serving oysters and other shell-fish. A communication.

Dated March 12, 1853.

620. John Gilby. Improvements in fire-arms.

621. William Muir. Improvements in machinery or apparatus for grinding edge tools and other articles.

622. Peter Armand Lecomte de Fontainemoreau. A new or improved apparatus for filtering liquids. A communication.

623. John Fry Heather. An equitable gas-weighing meter.

624. Auguste Edouard Loradoux Bellford. Improvements in machinery for cutting standing crops, and gathering the same into sheaves or bundles. A communication.

626. Thomas Evans the younger. Certain improvements in the construction of steam boilers.

627. George Michiels. Improvements in obtaining oxygen for manufacturing purposes.

628. Thomas Hunt. Improvements in the construction of sights for fire-arms.

629. Thomas Rhodes. Improvements in the manufacture of manure.

630. Robert Christopher Witty. Improvements in the manufacture of gas.

631. James Murdoch. An improved construction of portable voltaic batteries. A communication.

Dated March 14, 1853.

632. William Quinton, Benjamin Quinton, and John Quinton. Improvements in the construction and manufacture of measuring-rules.

634. William Edwards Staite. Improvements in apparatus for producing and applying current electricity, parts of which apparatus are applicable for obtaining and treating certain chemical products resulting from electrolytic action.

636. Bennett Alfred Burton and Henry Mortimer Burton. Improvements in the mode of manufacturing casks, vats, and other like vessels, and in the machinery or apparatus to be employed for such purpose.

638. John Henry Johnson. Improvements in dyeing. A communication.

640. William Stevenson. Improvements in the treatment or manufacture of textile materials.

Dated March 15, 1853.

642. William Morgan. The manufacture of a portable double-action folding chair.

644. Pierre Sigisbert l'Hernault and Jean Richard. An improved means for unhooking horses, and impeding or stopping vehicles on common roads.

646. Joseph Maudslay. Improvements in screw propellers for ships and other vessels.

648. Ephraim Sabel. Improvements in the construction of looking-glasses, and in the apparatus connected therewith. A communication.

Dated March 16, 1853.

652. William Malins. Certain improvements in the application of atmospheric propulsion upon railways.

654. Samuel Colt. Improved apparatus for heating and annealing metals.

Dated March 17, 1853.

658. John Talbot Ashenhurst. Improvements in pianofortes.

660. George Johnson. Certain improvements in looms for weaving.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 25th,* 1853.)

449. John Jones. Improvements in handles for knives, razors, and other like instruments.

468. Alexander Thomas. Certain improvements in the treatment and welding of metals by certain chemical combinations.

(*From the "London Gazette," March 29th,* 1853.)

608. Jérome André Drieu. Improvements in machinery for weaving, and for dividing double cloth to make pile fabrics.

725. Julien François Belleville. Improvements in generating steam for producing motive power or heat.

744. Gray Denison Edmeston and Thomas Edmeston. Certain improvements in steam engines, which improvements are also applicable to the regulating of water wheels, or similar machinery.

754. William Fraser Rae. Improvements in gas-heating and cooking-apparatus.

765. Joseph Johnson. An improved mode of producing ornamental articles, such as brooches, bracelets, dressing and other cases, work and other boxes, or other like articles, from a certain kind of wood.

814. Robert Heggie. Improvements in railway brakes.

830. James Armitage and Charles Thaxter. Improvements in dies for moulding plastic materials.

838. James Carter. Improvements in the manufacture of certain articles of dress or apparel.

840. John Gedge. An improved self-regulating artificial incubator. A communication.

29. William Bardwell. Improvements in treating sewage waters and matters.

48. George Stewart. Improvements in railways, and in the propulsion of engines, carriages, and other vehicles thereon.

97. Frederick Schneidner. A chair to be employed for preventing sea-sickness.

316. Richard Prosser. Improvements in the construction of printing rollers used in machines for printing calicoes and other substances.

337. John Buchanan. An improved propeller, as to affixing the blades in the boss, and affixing the bosses to the spindle or centre shaft, and in the mode of placing it, and in controlling, lowering, and detaching the same.

491. The Hon. James Sinclair, commonly called Lord Berriedale. Improvements in weaving.

510. William Edward Newton. Improvements in capstans. A communication.

526. Marcel Vetillart. Improvements in drying yarns.

544. John Hinks and George Wells. A new or improved metallic pen.

547. Joseph Sparkes Hall. Improvements in cutting out parts of boots and shoes.

560. Richard Archibald Brooman. Improvements in machinery for making pipes and tubes. A communication.

562. Richard Barter. Improvements in cutting roots and other vegetable substances.

592. James Kimberley. A new or improved gas-stove.

593. James Hogg, junior. Certain improvements in machinery or apparatus for cutting paper and other substances.

597. Joseph Shuttleworth. Improvements in appendages to portable machines for thrashing, shaking, and winnowing corn.

601. George Collier. Improvements in the manufacture of carpets and other fabrics.

603. Henry Hansford. Improvements in the manufacture of starch.

605. George Collier and Samuel Thornton. Improvements in spinning, roving, doubling, and twisting cotton, worsted, flax, and other fibrous materials.

607. James Walmsley. Improved machinery and arrangements for block-printing.

610. Thomas Butler Dodgson. Improvements in roads or ways, pavements, and footpaths generally.

611. George Collier. Improvements in machinery or apparatus used in weaving.

612. The Hon. William Erskine Cochrane and William Marshall Cochrane. Improvements in girths or pads for retaining saddles in their places.

614. James Stevens. Improvements in apparatus for facilitating communications between the guard and engine-man of railway trains.

616. Francis Preston. Improvements in the manufacture of bobbins and spools.

619 Moses Poole. Improvements in apparatus for serving oysters and other shell-fish. A communication.

627. George Michiels. Improvements in obtaining oxygen for manufacturing purposes.

628. Thomas Hunt. Improvements in the construction of sights for fire-arms.

629. Thomas Rhodes. Improvements in the manufacture of manure.

634. William Edwards Staite. Improvements in apparatus for producing and applying current electricity, parts of which apparatus are applicable for obtaining and treating certain chemical products resulting from electrolytic action.

646. Joseph Maudslay. Improvements in screw propellers for ships and other vessels.

654. Samuel Colt. Improved apparatus for heating and annealing metal.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

650. John Vanden Hielakker. An improved eccentric engine applicable to the purposes of general navigation. March 16.

WEEKLY LIST OF PATENTS.

Sealed March 28, 1853.

1852:
38. The Hon. Wm. Erskine Cochrane.
71. John Ambrose Coffey.
175. Michael Cavanagh.
177. Wm. Simpson and Jno. Shelton Isaac.
217. Michael Angelo Garvey.
236. Robert Brown.
257. Alexis Delemer.
298. Edward Joseph Hughes.
311. Auguste Edouard Laradoux Bellford.
562. Arnold James Cooley.
919. James Barlow.
1170. George Fergusson Wilson.

1853:
22. Gustave Eugene Michel Gerard.
77. John M'Dowall.
154. William Edward Newton.
195. Isaac Davis.
242. George Twigg and Arthur Lucas Silvester.
250. Walter Williams.
254. Thomas Lightfoot.
276. Alfred Vincent Newton.

Sealed March 30, 1853.

1852:
7. John Henry Gardner.
42. Oswald Dodd Hedley.
44. James Hodgson.
52. Walter M'Lellan.
63. John Fordham Stanford.
66. George Holmes.
68. George Ellins.
69. William Moore and William Harris.
72. Edward Wilkins.
91. William Walker.
92. Thomas Lawes.
93. Thomas Lawes.
94. Thomas Lawes.
104. Martyn John Roberts.
110. John Wright and Edwin Sturge.
111. John Remington and Zephaniah Deacon Berry.
139. William Lewis.
142. Henry Bernouilli Barlow.
143. John Lawrence Gardner.
144. William Seaton.
147. Edwin Whele.
148. Edward William Kemble Turner.
156. Joseph Brown.
165. Moses Poole.
170. Edward Allport.
171. William James Lewis.
173. Theophilus Redwood.
176. Peter Hyde Astley and John Figgins Stephens.
180. John Slack.
222. Aristide Balthazar Berard.
225. Joseph Apsey.
242. William Mackenzie.
282. John Blair.
292. Samuel Rainbird.
326. Charles William Siemens.
371. Walter M'Farlane.
383. Donald Grant.
408. Wm. Jas. Mathias and Thos. Bailey.
459. Charles Weightman Harrison and Joseph John Harrison.
472. Joseph Rose.
490. Stanislaus Hoga.
545. Charles Benjamin Normand.
1064. Jean François Isidore Caplin.
1153. John Hinks and George Wells.

1853:
51. Hezekiah Marshall.
79. John Hick.
152. George Thornton.
156. Matthew Andrew.
273. John Cockerill and Thos. Barnett.
275. James Carter.
299. Alfred Tylor and Hen. Geo. Frasi.
304. Frederick John Jones.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

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Mechanics' Magazine.

No. 1548.] SATURDAY, APRIL 9, 1853. [Price 3d. Stamped 4d

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MEDHURST'S PATENT WATER-METER.

Fig. 1.

Fig. 4.

Fig. 2.

Fig. 3.

MEDHURST'S PATENT WATER-METER.

(Patent dated September 27, 1852.)

THE principle of the instrument invented by Mr. Medhurst for ascertaining the quantity of water which passes through it in a given time, consists chiefly in employing the pressure of the fluid to act against two flexible diaphragms placed between chambers into which it is admitted alternately, and which diaphragms yield to the pressure alternately in opposite directions, displacing at every movement from the one chamber a quantity of water equal to that admitted into the other. Motion is thus given to spindles, which is ultimately communicated to the slides for the inlet and outlet of the water, and to the registering and indicating apparatus.

Figs. 1, 2, 3, and 4 are different views of a water-meter constructed upon Mr. Medhurst's arrangement; fig. 1 being a plan, with part of the cover removed to show the slides, &c.; fig. 2 a vertical section on the line *a b* of fig. 1; fig. 3 a vertical section taken at right angles to fig. 2; and fig. 4 a sectional plan. A A is a strong cylindrical metal casing, closed at the ends by the hemispherical covers A^1 A^2, and divided horizontally by the partition B, in which are formed the apertures for the inflow and outflow of the water to be measured. The portion of the casing devoted to the measuring arrangements is divided into two compartments by the vertical division-plate B^1, and each of these compartments is again divided into two chambers by the metal frames C C—the body of the meter thus being divided into four chambers, 1, 2, 3, 4. The frames C C are fitted with flexible diaphragms or bags D D, which are composed of vulcanised sheet India-rubber, India-rubber cloth, leather, or any other waterproof and sufficiently flexible material. The manner in which these flexible diaphragms or bags are fitted to their frames is as follows:—The diaphragms are cut from a sheet of either of the above-named materials, of a size and form adapted to the capacity of the meter; they are then secured to the centre of the frames, from which a portion of the metal has been previously cut out, leaving an orifice of dimensions suited to those of the diaphragm, by placing their edges between the two thicknesses of metal plate composing the frames, so as to cover the orifice, and then riveting the plates together. On each side of, and partially covering the flexible diaphragms, there is then attached a plate of metal, cut to a size that will pass freely through the orifice in the frame when the diaphragms are moved in either direction by the action of the water against them. A metal tongue *e* is secured to one side of each of the diaphragms, and the ends of these tongues are attached to rocking spindles or shafts E E, which, by the motion of the diaphragms receive a reciprocating action, and thus, in connection with other arrangements which we shall presently notice, produce the necessary motion for actuating the slides and registering apparatus. F F are stuffing-boxes in the partition-plate B, through which the ends of the shafts E E pass. These shafts carry levers G G at right angles to each other, which drive the crank H on the axis I by means of the connecting-rods *g g*. On the axis, I, are also fixed two other cranks J J^1, which, by means of the connecting-rods *j* j^1, give motion to the slides or valves for the inlet and outlet of water to and from the chambers of the meter. K K^1 are the slides or valves, the construction and operation of which are precisely similar to those of the slide-valve of a steam engine. L is the inflow-pipe, which supplies the water to be measured, and M the outflow pipe, which communicates with all the chambers of the meter by means of the passages *m m*. *n n* are the induction passages, by which water is admitted to the chambers 1, 2, 3, 4, on opposite sides of the diaphragms alternately. N is a worm on the axis I, which gears into and drives a worm-wheel N^1 on the shaft O, the opposite end of which passes through a stuffing-box in the side of the end cover A^1, and gives motion to a train of wheels which constitute the registering apparatus.

This being the construction of Mr. Medhurst's meter, its operation will be readily understood. On the admission of water into either of the chambers 1 or 2, the flexible diaphragm will be caused to pass, by means of the pressure exerted against it, into the adjoining chamber, and the rocking-shaft with which the diaphragm is connected will be caused to vibrate in its bearings. A similar action will at the same time be going on in the chambers 3 and 4, and the vibratory motion of the rocking-shafts E E will, through the levers G G and connecting-rods *g g*, produce the rotation of the crank-axis I. The cranks J J^1 and connecting rods *j* j^1 convey motion from the revolving axis to the slides K K^1, by which the supply of water to the chambers 1 and 3 will be cut off, and the water admitted to the chambers 2 and 4—that is, on the opposite sides of the diaphragms. At the same time the eduction-ports from the chambers 1 and 3 will be opened, and the water contained in them discharged through the outflow-pipe M, in consequence of the pressure of the water on the opposite sides of the diaphragms. The motion of the slides will then be

reversed, and the water re-admitted to the chambers 1 and 3, while that contained in the chambers 2 and 4 will be discharged, and the preceding action will be repeated. The number of revolutions of the shaft I, and consequently the quantity of water passed through the meter, will be indicated by the registering apparatus, which, as before mentioned, is impelled by a motion derived from the shaft, I, by means of the shaft O.

The arrangement of the train of wheelwork of the registering apparatus will, of course, vary with the capacity of the diaphragms when distended, and the number of revolutions of the crank-axis, I, required to indicate the passage of a given quantity of fluid through the meter.

PRELLER'S PATENT LEATHER PROCESS.

On Saturday last an opportunity was afforded us of witnessing the operation of the process for the conversion of the hides and skins of animals into leather, which has been patented by Mr. Charles Augustus Preller. This method of treatment is so remarkable for its originality, and attended with such excellent advantages in the course of manufacture, and in the character of the produced article with reference to the requirements of practice, as to promise nothing short of a complete revolution in the arts of the tanner, and the establishment, to a certain extent, of new criteria by which the qualities and value of leather for practical purposes are henceforth to be estimated. A large factory in Lant-street, Southwark, has been fitted up by Mr. Preller, and he is there carrying on his manufacture to a very considerable extent, and with a degree of success which could hardly have been supposed would attend his efforts in the comparatively short time which has elapsed since he began. His leathers have already acquired a high reputation in the market, and are rapidly getting into favour for a variety of manufacturing purposes, especially for driving-bands, for which their superior strength, flexibility, uniformity of texture and durability, render them eminently serviceable. The comparison of qualities produced under this process with those of the oak tan, catechu, and others, are so numerous and so striking, that we propose to give a short account of the subject as it presents itself to our observation at present.

The first stage of the process is analogous to that which the hides or skins undergo in the tan-yard. When the horns have been removed, the hides are slightly washed, and then unhaired in the usual manner. Next they undergo a partial drying, and receive a uniform coating of a peculiar paste, the composition and mode of preparation of which is fully detailed in Mr. Preller's specification, and explained generally in No. 1519 of the *Mechanics' Magazine*. This paste is worthy of notice, as constituting the main feature of the invention; but it will be sufficient for our purpose at present merely to state its general nature, as being a compound of various vegetable, animal, and saline substances. The choice of the vegetable substances employed is determined by the condition that they shall contain a large proportion of starch, and little gluten—such, for instance, as barley-flour, rice-flour, or starch itself. The animal substances are of an oily or fatty nature, the patentee preferring ox-brains, butter, milk, animal oil, and grease. Salt and saltpetre are used merely as preservatives for the brains and the butter. As barley-flour contains an abundance of starch,—720 parts in 1,000 according to the analysis of Einhof,—this material has been economically selected to form the basis of the impregnating paste, and the other materials added serve to give properties to it for which the gelatinous nature of the skin exhibits a remarkable affinity, the exact chemical nature of which it is not easy to ascertain.

The paste having been prepared according to the directions contained in the specification, which involve the most simple appliances, and but a small amount of labour, the hides are laid upon large tables, where they are smeared with it on the flesh side, and in that state they are put into the interior of large drums mounted upon horizontal axles, to which a rotary motion is imparted. Four of these drums were in operation at the time of our visit. They are each about 9 or 10 feet in diameter, and 5 feet long, and are furnished with a square hole at either end through which the hides can be passed. Around their inner peripheries a number of stout pegs are disposed radially, the intention of which is to agitate the hides forcibly, so as to effect an equal distribution of the moisture they still retain, and the complete and uniform absorption of the paste throughout their fibrous system. The drums are driven by a derived motion from the shafting of a steam-engine, can be readily thrown into or out of gear, and their speed is susceptible of ready adjustment, according to the state of forwardness of the process. To promote a drying action, which is frequently desirable, the waste steam from the engine is conducted into a large chest, from which a main passes along the floor near the cylinders,

and a communication is effected between this and the interior of the drums by the use of connecting pipes and hollow axles, which can be closed or adjusted by a stop-cock. Having been kneaded forcibly together in this manner for some hours,—more or less, according to the nature and thickness of the hides,—the drums are thrown out of gear, and the hides drawn out. It is now ascertained that the work of absorption and of partial drying has gone on vigorously, and with uniformity, and that the hides not having yet attained the point of saturation, are ready for another supply of the paste. Previous to this, however, they are hung up in an airy part of the room, so as to insure a more perfect uniformity of condition. They are then smeared over with the paste again, returned to the drums, and the same process repeated a second time, and afterwards, in general, a third time, when a cut into the substance of the material displays a perfect uniformity of colour and of substance, proving that the conversion of the gelatinous mass has been equal and complete. They are now ready, after a little more drying, for the operations of the currier, who finds that his work is considerably lessened in amount by the effects of the above process.

This being the general nature of Mr. Preller's process, we have a few facts to state which will show the principal characteristics of the resulting leather, and the advantages which it possesses over ordinary leather for a variety of purposes. One of the most remarkable qualities of Preller's "H. B. Crown" leather is, that it is smaller in weight and in thickness than leather produced by tanning. At present there is a great prejudice in favour of stout and heavy leather for purposes where great strength is desirable; but this is fairly attributable, in part, to the action of moisture during the tan process, and in part to the interest which the tanners have in producing weight. Some of their processes, indeed, have been directed with this object in view, while achieving which, the quality of the leather has, to a great extent, been injured. The comparison of the two systems on the question of weight has been represented to be as follows:—100 lbs. weight of "green" hide will yield by oak-tanning 50 lbs. of leather, and only 34 lbs. by Preller's process. With weight as a standard of excellence, therefore, the comparison would be extremely unfavourable to the new process, and we must therefore see how they answer respectively the great purposes which arise in the manufacture. In Preller's process the hide is left to the natural operation of the converting substance applied, without the intervention of any mechanical means to hasten it, which could only lead to an injurious result. It appears that the fibrous structure of the hide, and the whole of it—which is extremely important—is preserved in a condensed state, thus accounting for its great strength, and its greater reduction of bulk. If a piece of oak-tanned leather be rent asunder forcibly, the internal structure disclosed appears rather to be of a felty character than otherwise; but upon subjecting any piece of "H. B. Crown" leather to the same test, all the fibres will be perceived to be in close juxta-position, and with no sensible deviation from their original parallelism. The comparison, in point of strength, gives great superiority to the new process. It has been found that oak-tanned leather, of 3-8ths of an inch in thickness, is incapable of resisting the strain which Preller's leather of 1-4th of an inch in thickness will resist in constant working. A strip of it a yard long, about half an inch in width, and 1-8th thick, gave way with a breaking weight of 6 cwts. 20 lbs., while ox-hide, well tanned on the oak-bark system, and of the same dimensions, could only resist a strain of 5 cwts. As another illustration of the superior strength of Mr. Preller's leather for driving-bands, we may mention a circumstance which was told us at the factory, that on one occasion, to lengthen a driving-band made of his own leather, he added to it a piece of oak-tanned, and that the latter gave way in the performance of its work. Sheep-skins, kid-skins, and some other species of leather, which in general may be torn asunder in the hands with the exercise of only a small degree of force, acquire in this process a strength which is quite surprising, of which we had experience ourselves when a piece of split sheep-skin, of large size, was put into our hands, and we were requested to try to break it.

As this leather combines strength with thinness, and also with lightness, it is eminently adapted for driving-bands. Its superior thinness and flexibility enables it to be passed round pulleys of only a few inches in diameter; in which service it will continue effective for a considerable time. When thick leather is employed for a similar purpose, the fibres of its running surface are compressed, and those of its outer surface extended, within the limits of the extreme points of contact; and the rapid change of state from the normal to the extended, soon exhibits itself in cracks and fissures, which are a source of loss of power, and vitiate the tension originally intended. The thinness of Preller's bands obviates this state of things; as the whole of the leather more nearly corresponds in its condition to that of the neutral line. The bands

which consist of only one thickness of leather, are formed by simply cementing the ends of successive lengths, which have previously been thinned away to an edge by the knife. In this chamfering process the fibres crop out in abundance, and when the two surfaces are brought into close contact, with a layer of cement between them, the fibres on opposite sides embrace each other firmly, and give enormous strength to the band. Compound bands, for heavy work, are made by using two, three, and sometimes four thicknesses of ox-hide, which are united by countersunk stitches. In either case, the motion is perfectly smooth—not the slightest jerking action being propagated throughout the mechanism—a result of the greatest value.

A very considerable saving of time in the process of making, is another important feature incidental to this invention. Calf-skin can be prepared in this manner in about twice eight hours, the time consumed in agitating it twice in the drums. A short interval is allowed to elapse between the two operations, but the action of the converting substance is not then continued. The thickest ox-hide requires only two days and a half to be fully converted by the application of this process, of which Mr. Preller showed us an example in the hide of a large prize ox exhibited at the late cattle-show. Under the most favourable circumstances, it now requires four or five weeks' subjection to the tanning liquor. Under the old process of tanning, in which the hides were placed in the pit, with layers of tan to separate them, and afterwards filled with water, a very considerable period has been known to elapse during the process; sometimes amounting to four years. This old-fashioned method has not been yet completely abandoned for more scientific ones, and contrasted with it the great change which this invention has effected is the more remarkable. The walrus skin exhibited in the Great Exhibition took no less than four years to tan; but Mr. Preller estimated, that by his mode of treatment the conversion would be perfect in 60 hours, allowing 6 periods of agitation in the drum, each of 10 hours' duration. The economy of time in the conversion of the hide is a circumstance strongly favourable to the practical working of the system, and is calculated to give to this branch of industry a degree of activity not hitherto experienced.

As regards the capacity of the manufactured article for resisting water, its properties have been ascertained by repeated experiments, which have been attended invariably with favourable results. At Mr. Anderson's saw-mills, Whitechapel, where a 3½ inch driving-band, made by Mr. Preller, is in use in a part of the premises very much exposed to the weather, it has been found to work extremely well. These bands are in use in situations where the demands upon them are severe, and could only be met by great superiority of the material. Among other places may be mentioned the extensive engine-factory of the Messrs. Penn, at Deptford, who have just ordered three new ones of the larger sizes, and Mr. Preller has orders for Ironbridge and some large factories in Yorkshire, where the fitness of the qualities of his leather for this purpose have been recognised.

When ordinary leather is boiled in water, it gradually hardens and becomes rigid; and if the operation be continued for half an hour, it will be found to have assumed a kind of woody texture, and to have become brittle. Some descriptions of leather, on the other hand, become converted into a mass somewhat resembling glue. When Preller's leather is tried in the same way, it gradually approaches to the condition of horn, but it requires several hours before that state is attained. In its ordinary condition, as before observed, it is remarkably supple, and that quality admirably fits it for being used in the soles of shoes; for the West and East Indies, in particular, this quality is highly advantageous, and for the supply of troops would probably be found to be attended with economy, and productive of comfort.

We have little more to add to our account of this singular process and its results. Its thinness, pliability, and strength render it immediately available for a number of new purposes. Thus, by simple twisting, it forms an admirable material for "lacings," the strips with which the stitches of the compound driving-bands are made. By cementing two or three strips together into a triple thickness, and then paring the edges down to a circular form, an excellent lathe-band is produced, which is free from the tendency to become dry and stringy which is now observed in catgut bands. The "butt," or lower part of the horse-hide, which, on account of its greater thickness has usually been cut out and applied to separate purposes, is in this process found to be produced in so supple a state, that with a little paring down it may take part equally with the rest of the skin in any purpose to which it is applied. Thus a very large horse-skin is produced, which is extremely valuable for many purposes, especially for the coverings of carriages. Mr. Preller showed us some boot-uppers, and backs, made of horse-skin prepared by him, which are considered remarkably fine specimens. Their great softness, uniformity

of texture, and the high polish they bore, were certainly admirable. Another use of the "H. B. Crown" leather, to which it has been applied with success, is the thong, or strap, by which the shuttle of the loom is pulled aside. In practice these are found to give way in the sudden strain to which they are constantly subject; but the new process leather stands extremely well.

There are several other purposes to which this leather has been applied; but we have said enough to indicate its general nature and incidents, and the circumstances in which its use would be attended with practical advantage. These are becoming rapidly known and appreciated, and it is not too much to say that Mr. Preller has introduced into this department of industry a change which will prove as beneficial to the community, as, in a practical point of view, it has already shown itself advantageous, by improving the character of a most useful mechanical appliance.

SOCIETY OF ARTS.

THE ordinary weekly meeting of the Society of Arts was held on Wednesday evening, at their house in the Adelphi, Robert Stephenson, Esq., M.P., Vice-President, in the chair.

Professor WILSON, F.R.S.L., late principal of the Agricultural College at Cirencester, read a paper on the recent improvements in the treatment and dressing of flax. Having given some account of the appearance of the plant, the *linum usitatissimum*, its time of flowering, and the mode of reaping, the learned Professor proceeded to notice the dressing of the straw, the object of which was to separate the inner fibre from the two outer ones. Two methods had been invented for this purpose—the mechanical and the chemical,—the former of which dealt with the flax in a dry, and the latter in a wet state. As the poorer sorts of flax would not pay the expense of "steeping," the mechanical method was best suited for them: but it had the disadvantage, from not touching the azotized portion of the plant, to leave it with its liability to ferment and deteriorate. Lee's patent in 1812, and Hill and Bundy's in 1819, were directed to this point, but they did not remove the objection, which only chemical means could surmount. In one of these the fermentation was directly excited, and in another the azotized substance was "steeped out." Two plans of proceeding had lately been brought into operation, which were likely to effect a complete revolution in the manufacture. One method was to immerse the flax in still or running water, and "dew-retting," the object of which was to excite and exhaust the fermentative action. It had lately been perceived that hot water accelerated the process—a fact which appeared to be known to the Malays and the Bengalese—and which was the basis of the process known as "Schenck's." This plan was patented in 1846, and in 1848 the first "rettery" was established under the patent, in the county Mayo. It was satisfactory to know that since that time between twenty and thirty of these establishments had been founded in Ireland, besides others in England and Scotland; and in Ireland about 40,000 tons were now prepared by this process annually. A considerable economy was proved to result from the operation of this system, in an extensive series of experiments instituted by the Irish Flax Improvement Society, amounting to 20 per cent., while with respect to the quality of the product, two samples yielded respectively 70 and 101 yards, while two similar ones, prepared upon the cold process, produced only 60 and 96. The market returns were as 10*l.* 12s. against 9*l.* 8s. on a given quantity, and in point of time the saving was three or four days, instead of as many weeks.

In the practice of Schenck's patent it appeared that 100 tons of the straw by seedling, or removing the seed-bolls by rolling, produced 67 tons of pure straw, which, when steeped, yielded 39½ tons of steeped straw, and ultimately 5·9 tons of dressed flax, and 1·47 of tow. Flax straw was always delivered in Ireland with the seeds upon it, but in England and Scotland that portion of the plant was removed previously.

The treatment of flax by alkalies, as a means of dissolving its extractive portions, appeared to have been recommended by Lady Moira in 1785, and a factory was established near Vienna, in which it was practised. Berthollet, Gay Lussac, and other chemists, were also acquainted with it. Mr. Wilson next proceeded to describe the invention of Watts, of Glasgow, introduced in the early part of last year, by which the subsequent portion of "scutching" was rendered more easy, and the operation of steeping much accelerated and improved, a period of from eight to twelve hours being sufficient to bring it into the state necessary for scutching.

Watts' process consisted in the use of steam, and of steam alone. For this purpose the steam was conducted from the boiler into the lower part of a large and close vessel, of a capacity sufficient to admit the quantity of straw to be operated upon. This vessel was provided with a false bottom, situated over the steam-pipe, and upon which the flax rested. As the

steam entered the vessel, it rose through the mass of flax, and condensed upon the roof of the vessel, to facilitate which object the roof was made the bottom of a tank of water. As the condensation of steam upon a flat surface would lead to a very unequal distribution of the hot water which became generated, the roof was furnished with a number of short pendent spikes, from the points of which it trickled uniformly over the entire surface of the straw. He saw this method in operation at Belfast last year. The process was continued from eight to twelve hours, after which the extractive portions were found to be dissolved out, and the steep-liquor, which was first drawn off into a tank, was afterwards preserved for feeding purposes. The flax was next passed through six or eight pairs of rollers, to express the water which was held in suspension in its capillary tubes, and of which it was usually found to contain as much as 80 per cent. In this process the epidermis, or skin of the flax, was broken, the contact between the "boon" and the other portions altered, and their separation by the subsequent process of scutching rendered more easy. From eight to twelve hours was all the time now necessary to bring the straw into a fit state for scutching. An economy of space resulted from the adoption of this system, and the Messrs. Leadbeater, of Belfast, were adopting it extensively. He had seen an experiment with it, in which 10 cwts. of flax were steamed for eleven hours, and when taken out and dried, were reduced to 7 cwt. 11 lbs. This was afterwards scutched, and yielded 187 lbs. of fine flax, 12 lbs. 6¼ ozs. of fine tow, and 35 lbs. 3 ozs. of coarse tow. The yield, therefore, was at the rate of 18 lbs. of fine flax for every cwt. of straw. The time occupied in actual labour was 13¼ hours, to which 11 hours must be added; making together 24¼ hours from the first step down to the commencement of the scutching. It was calculated in practice that 36 hours were necessary to convert the flax straw into fibre fit for the purpose of the spinner. The cost of all the operations, except the drying, was under 10*l.* a ton. The yield was good, and the yarns equal in quality to those from Irish flax of the best sort.

Buchanan's, also a Scotch invention, was the next improvement. The principle of it was the use of hot water in a more elaborate arrangement than that of Watts. It could not be supposed that it was the steam that was effective in that process, because it was known that steam exerted a very slight action as a solvent for flax, and that water at the temperature of 140° was more active for the purpose even than boiling water. The plan proposed by Buchanan commenced with the steam-pipe from the boiler, which was conducted nearly to the bottom of a vessel, while another pipe proceeded nearly from the bottom to a second vessel, which contained the flax. A tank of water was placed over the first vessel, which, being first filled with cold water from it, the steam imparted its heat to it, until its temperature was raised so high that it would absorb no more. It then acted mechanically by its pressure, and forced the hot water into the flax in the next vessel. The system of vessels employed embraced a third of much smaller dimensions, for the purpose of adjusting the strength of the steeping liquor from time to time. An exceedingly ingenious mechanical arrangement, which rendered the process self-acting, effected the admission or stoppage of steam from the boiler, the filling of the first vessel from the tank, and the action of the last vessel mentioned. This was suspended, and descending by its own weight when filled with fluid, emptied itself by striking a valve in its bottom against a fixed obstacle, after which it rose. The motion was rendered available with weights acting over pulleys, for opening or shutting certain of the passages. Thus the steep-liquor was heated by steam in one vessel, and driven over by steam pressure into another, where the flax was placed, and in which condensation took place. The steep-liquor was then withdrawn by the continuous action of the apparatus, and the operation repeated. The first immersion generally lasted ten hours, and was followed by others of only ten minutes each. After ten immersions, it was found that the whole colouring matter of the plant was abstracted, and the steep-liquors were added to chaff and other matters, in a form not only inoffensive but valuable.

The advantages of the steeping-liquor for feeding purposes were highly important. It was found to contain 15 grains of nitrogen per gallon, and was fully equal to distiller's wash. Watts' process took from 24 hours to 36 hours to the end of the steeping, and Buchanan's about a third of that time. In the latter process, the drying was effected by the use of porous earthen tubes in the lower part of the chimney shaft, through which the hot air from the flax was made to pass; thus carrying off its moisture. Everything, therefore, under Buchanan's process, was carried on beneath the same roof. The yield was equal to other processes, and there was a great saving of manual labour. With regard to scutching, mill-scutching fetched nearly double as much as hand-scutching. The remaining processes were spinning, weaving, and bleaching.

The summary of the statistics of the flax and linen manufactures were as follows:—In England there were from 250,000 to 300,000 spindles at work; in Scotland, between 300,000 and 350,000; and in Ireland upwards of 500,000;—altogether exceeding 1,000,000. The fixed capital invested only in plant, and the necessary contingencies of such a branch of industry, exceeded 5,000,000*l.* in England alone for the processes of spinning and weaving. With regard to the agricultural portion of the subject as it now stood, the requirements of trade exceeded the power of production. We had imported 70.000 tons of flax fibre every year, and 650,000 quarters of linseed, either for sowing or for pressing the oil, while for feeding, we relied on foreign produce for 70,000 tons of oil-cake annually. In the aggregate, we were paying between 4,000,000*l.* and 5,000,000*l.* to foreign countries for produce which our own was eminently calculated to produce.

Mr. Wilson having concluded his paper, a vote of thanks was passed to him on the proposition of the Chairman, and the meeting terminated.

THE TRADES OF BIRMINGHAM.

The gigantic projects of Sir Charles Fox are adding largely to the manufacturing reputation of Birmingham and its vicinity. A few weeks ago his enterprising firm were making some large gasometers and apparatus for Lima and Rome, and now one of the most remarkable specimens of the productions of our South Staffordshire manufacturers is a monstrous gasometer, in course of construction at the works of Messrs. Joshua and William Horton, at Smethwick, for the Sheffield Gas Consumer's Company. It is only a few years ago that several of the most eminent engineers of the day gave evidence before a Parliamentary Committee to the effect that a gasometer of greater diameter than 35 feet would be very dangerous. Although subsequently practical men proved such an idea to be chimerical, no one had attempted to manufacture a gasometer at all approaching in size the one to which we now allude. Its diameter is no less than 165 feet, but these colossal dimensions do not form its only characteristics worthy of notice. In such a work the raw material is usually the chief part of the cost; and by bringing a recent patent to bear upon the construction, the Messrs. Horton have effected a saving of no less than 2,000*l.* in this respect, through the absence of the heavy iron framework which usually supports the roof of a gasometer. Nor is this the only improvement in progress with regard to the construction of gas-works and their necessary apparatus. Messrs. Horton are also engaged in manufacturing telescopic gas-holders on a new principle, by which still further economy in labour and material will be effected. They have also an improved tubular boiler, by the use of which one firm in Birmingham is said to be saving from 600*l.* to 800*l.* a year in the smaller amounts of fuel required, as compared with ordinary boilers. It is to these continual improvements in the make of Birmingham and Staffordshire productions, for the most part suggested by the industrious artisans of the neighbourhood, and supported by the spirited enterprise of the leading manufacturers, that the prosperity of the district is in a great degree attributable.

The contract for supplying the new copper coinage for Great Britain has been obtained during the past week by Messrs. Heaton and Son, of Birmingham. The weight of coin required by the contract is no less than 500 tons, to be minted into pence, halfpence, farthings, and half-farthings, and —novel currency—quarter-farthings. The copper is to be of the best quality, and the dies are to be supplied by the Mint. The operation of casting this vast weight of metal will not be commenced before the end of June; and when once begun Messrs. Heaton will not be required to furnish more than 80,000 pieces a day. This firm were the purchasers of the celebrated minting machinery at Soho, where the old heavy and solid pence were coined at the latter end of the last century. There is scarcely another firm in the kingdom which could undertake this work, and we may mention that the copper coinage of Canada and the French Empire are being simultaneously executed by the same house.

The heavy machinery and railway business, in the orders for which iron constitutes the sole material, is extremely active. Extensive orders are in the district for all descriptions of railway, and, should the tenders sent in be accepted, there will be a great increase in the present abundant work of the neighbourhood. Axles, chairs, wheels, &c., are required in great quantities.

The Australian trade is still active, but many of our Birmingham exporters are apprehensive of a glut. There are symptoms of an overstocked market in Melbourne, and merchants are becoming cautious in their supply of manufactures.

THE IRON TRADE.

The ironmasters of South Staffordshire at their preliminary meeting held on Thursday, reduced the price of bar iron 1*l.* per

ton, and all other descriptions in a similar proportion. Several of the great firms of the district were, we understand, opposed to the proposal, but the injury done to small manufacturers of articles of hardware by the high price of the raw material induced the "trade" reluctantly to assent to it.

In reference to this reduction the *Birmingham Journal*, after deprecating former unnecessary and impolitic advances, says, "We believe that at the prices now fixed by the meeting a sound and large demand may be maintained for some time longer. Buyers have been holding off during the quarter in anticipation of this decline of price, and orders may now be expected to flow in pretty freely. Moreover, there are two circumstances which must operate in preventing prices from going down much further at present. The stocks on hand are small, and it is feared that, as the summer advances, the make of iron will be just what the workmen please—that is to say, scarcely more than one-half of the producing powers of the district." It ought to be borne in mind that, although bars are nominally fixed at 10*l.*, there are many makers who are not bound by the regulations of "the trade," who will sell at less, and who during the present week have entered into contracts upon lower terms.

Indeed, it is now admitted on all hands, that it was utterly impossible to keep up our continental and American trade with bars at 11*l.* per ton; pig iron from 5*l.* 10s. to 6*l.*, and all other description of iron in proportion. The American spring buyers, who have just left here, have not taken with them heavy iron goods for stock, having, as they stated, reason to believe, from the accounts they had received from home, that the whole of the available mines in the United States would be forthwith put to work, if the prices continued high in England. Many furnaces have been already blown in, and a considerable yield obtained from them, so that it is evident sound policy has dictated to our South Staffordshire makers the propriety of a descending scale. The sudden and enormous advance which they made from 5*l.* to 11*l.* per ton, could not fail to produce derangement in the trade, and eventually lead to reaction. Even at 10*l.* it will require no small efforts to maintain our ground abroad.

Glasgow Pig-Iron Market, Glasgow, April 2.—Throughout this week pig-iron has been firm, and prices have advanced slightly, the market closing very firm at 55s. cash for warrants; buyers at 54s. 9d. No. 1, G.M.B. quoted 55s. 6d.; No. 3, 54s. 6d.; No. 1 Gartsherrie, 57s.; against shipment. The demand for tonnage continues active, and scarcity of ships is much felt.

America.—By the Royal Mail steamer *Africa*, which arrived at Liverpool on Sunday morning with advices from New York to the 23rd ult., we learn that iron was not much inquired for in the market of that city, and that prices were nominal.

THE "ERICSSON."

In the present state of our information on the subject of the caloric ship *Ericsson*, her actual efficiency for long sea voyages, and the probable intention of her owners with regard to her, the following letter from one of our correspondents at New York, will perhaps be deemed acceptable by our readers:

New York, March 15th, 1853.

Dear Sir,—I would long since have sent you an account of the *Ericsson* steamer, but, from the difficulty of getting you anything like a practical and unbiassed description or opinion, I was obliged to content myself with sending you the account rendered by the press of the day. She has, however, returned to this port from Washington, after having been there for the purpose of treating the Legislature, with a view to get an order for a few vessels; but the vote of the House appears to have gone against the order for ships with caloric engines. They have given an order for a land one, to see how it will work; but they might have been supplied with all the data, so far as the stationary engine is concerned, by getting the drawings and description of Stirling's engine, which has been working at Dundee for more than the last ten years, to my knowledge, and which is as nearly like the caloric engine as may be. The rate of sailing under the influence of the engines, without the aid of canvas, I cannot obtain; for she has been so long on her voyage that they are ashamed to make the times and rate of speed known. The proprietors appear to me to have considered their bird able to fly before the wings were properly grown, like the generality of American inventions. When the vessel made a trial trip down to the Bay of New York, she was brought up next day by a tug-steamer, which had rather a suspicious look; but the wonderment soon vanishes when you are made acquainted with the fact, that previous to starting it is necessary to get up the pressure in the air reservoirs by means of hand-pumping, or by the aid of a small engine. As the present time, the *Ericsson* is fitted with a small engine for the purpose; and the least possible time in which they have yet been able to get up the

requisite pressure for starting has been 40 minutes. This, however, it is fair to state, is a considerable reduction from 2 hours, the time taken at the first stages of the trials; and it is possible it may yet be greatly shortened. As the matter stands at present, it entirely precludes the idea of this kind of mover being employed for river-boats, if it does not equally incapacitate it for sea-going purposes. The machinery of the *Ericsson* had a very favourable external appearance, indeed, previous to starting; but after she has made one trip to the mouth of the bay and another to Washington, she has come back almost a total wreck in so far as concerns the principal parts, and for reasons which I see, by the *Mechanics' Magazine*, some of the members of the Institution of Civil Engineers of London very judiciously expressed some fears, although the evil does not necessarily appear to be beyond the limits of meeting a remedy. In the steam engine, the pressure sustained by the boiler remains nearly uniform; but in the caloric engine, on the contrary, the pressure is with every successive stroke of the machine brought up to a maximum, and then again suddenly reduced, which amounts to something like an unnatural and violent breathing. In the steam engine this appears natural, although forcible. The results of this action very soon began to show themselves upon the air-heating chambers, but especially on those surfaces next to the fire, which, being made of malleable iron plates riveted together, their continuous expansion and contraction very soon slackened the rivets and permitted the escape of air. The air reservoirs, which are also made of malleable iron plates, riveted similarly to those of a steam boiler, were strengthened by stays, and the action of the continuous inspiring and expiring made the rivets give out, and the stays give way, so that upon the return voyage the *Ericsson* made a very bad passage. One of her eight furnaces had to be stopped altogether. One stoker is enabled to keep the whole of the eight furnaces going, having only to put in about 60 lbs. of coals into each of the furnaces at intervals of 80 minutes. The coal used is anthracite. Of course, Newcastle coal would not do to be treated in the same manner as the anthracite. The furnaces of the caloric engine, which are eight in number, require the greatest attention, much more so than those of the steam engine; for if the temperature gets either a very little too high, or a very little too low, the action of the engine ceases. Upon the whole, the disappointment to the Americans will be considerable; after the great noise and expectations which were raised on the subject; and I question very much if they have got anything like the same amount of power as the same quantity of fuel applied to the steam engine would have produced.

ENGINEER.

THE "GREAT BRITAIN."

THE screw-steamship *Great Britain*, whose arrival from Australia had been long and anxiously looked for, was telegraphed off Holyhead at six o'clock on Saturday morning, and arrived in the Mersey about four o'clock in the afternoon. On its becoming known throughout the town that she had been telegraphed, thousands of persons hastened to the different pier-heads, in order to secure places from which to obtain a good view of her massive proportions as she steamed up the river. The scene that presented itself when she rounded the Rock Lighthouse was most remarkable, the pier-heads, for three or four miles in length, being closely packed with people, who manifested their approbation by giving several rounds of hearty cheering. She has brought 260 passengers, and gold-dust of the value of about 550,000*l.* on freight.

With respect to the passage of the *Great Britain*, it has been performed under peculiarly adverse circumstances—an insufficient supply of coal throughout. At no time during the trip have more than four boilers been in use, in place of six, and yet, notwithstanding that disadvantage, she could, without the aid of canvas, steam upwards of 200 miles per day. She sailed from Hobson's Bay, Melbourne, on the 6th of January, and arrived, on the 10th of February, at Simon's Bay, where she was detained upwards of eight days coaling. After coaling, she went to Table Bay, whence she sailed at four a.m. on the 20th of February, and afterwards put into St. Michael's and Vigo, where she was detained four days. Her passage from Melbourne, including detention, is 86 days, but, deducting detention, only 72 days. The highest rate of sailing on any one day was 248 miles, and the lowest 100. The total distance sailed over, as per log, is 14,688 miles, which gives an average speed for the 72 days of 204 miles per day. The passengers speak in the highest terms of the qualities of the ship, and also of the courteous and gentlemanly conduct of the commander (Mr. R. Matthews) and officers towards them.

It is the intention of the owners of the *Great Britain* to despatch her again to Australia in a short time.

We are informed that the *Great Bri-*

tain's bottom was not examined previous to her departure for Australia, the composition she had been coated with (Messrs. Peacock and Buchan's) having been laid on upwards of nine months before, and although clean as far as could be observed before leaving the Liverpool Docks, we understand that the inventors of the composition (Messrs. Peacock and Buchan) protested against the consequences of her going on so long a voyage without being recoated. It is now seventeen months since she was docked, and it is therefore natural to suppose that her bottom must be very foul, and hence the protraction of the voyage, there being no means of examining so large a vessel in Australia.

TRIAL OF THE BOOMERANG PROPELLER AT LIVERPOOL.

On Tuesday afternoon, a trial of Sir Thomas Mitchell's "boomerang" propeller took place in the Mersey. The trial trip was made in the *Genova*, one of Messrs. M'Kean and M'Klarty's Mediterranean steam-ships, the distance being from the Rock Light to the Crosby Lightship and back. The boomerang is used in a similar way to the ordinary screw, but its design and construction are widely different. The original idea was borrowed by the inventor from the peculiar gyrations of the weapon used by the natives of Australia in its flight through the air. That instrument is crescent-shaped; but, instead of an arc, it has an elbow in the middle. It is about 2 feet long, and about 2 inches broad, a quarter of an inch thick, and is made of heavy wood. When thrown in the air by the natives, it describes two revolutions, one direct and the other rotary. By the latter motion it revolves round its own centre of gravity, is enabled to survive the direct impetus with which it is sent up, and is made to screw back to the spot whence it was thrown.

This peculiarity suggested what is called "the boomerang propeller," which, in the course of the day, was described by Sir Thomas Mitchell. After many experiments made for the purpose of discovering the best means of attaching a centre, so as to make the principle applicable to the propulsion of vessels, the various practical difficulties in the way were removed. The elbow-shaped weapon of the savage gliding through the air shows how the difficulty of the centre may be avoided; the cusps illustrate the mode by which engineers may regulate the circumference, while the general form of the missile, in acting obliquely on the radius of the rotary motion, teaches how it is possible to embrace two columns of water at once with the least possible surface and the least obstruction to the rotary motion, but, at the same time, with the greatest effect as a screw.

In the form in which the boomerang propeller was patented in 1848, its construction was made to depend upon an observation of the rotation of the boomerang about its vacant centre of gravity, in consequence of its crooked form, and Sir Thomas Mitchell conceived the idea, that this centre might be in the line which would cut off from the entire curve equal portions, the sum of which should be equal in surface to the central portion which remained. About a point so determined, accordingly, the propeller was made to revolve, and the result of the arrangement is to make the edges opposed to the water work in it obliquely to the radius of rotary motion, much in the manner in which a shell augur penetrates wood. It is conceived that a motion so produced has no tendency to throw the water into a cone.

The great difficulty of testing the true value of the invention has hitherto lain, and still continues to lie, in the fact, that screw-vessels are built with apertures too narrow for its application in its entire and complete form. It requires a space equal to at least one-third of the height of the aperture. The only opportunity the inventor has at present had for testing it—and this a very severe test—is by applying only mutilated portions of it, relying on the more harmonious nature of its surface compared with the screw now in use, and to its perfect freedom at the centre, which prevents it from choking, and, consequently, gives it greater facility for rotary motion. So great is the mutilation necessary to admit of a trial at all with ordinary steamers, that, whereas the chief advantage of the boomerang propeller is in its embracing two-thirds of the helix at once, the two blades of the one used in the *Genova* were not more than one-seventh each of the complete spiral, or less than one-third on the whole.

Another advantage in the boomerang is, that from the convexity of one blade and the concavity of the other, the water is prevented from being driven to the centre, and thus choking it, as in the common screw, and direct steering is thus materially facilitated.

The severest test that could be applied was submitted to yesterday. The pitch of the two mutilated portions was nearly double the diameter—that is, the pitch was 23 feet 2 inches, and the diameter 12 feet 3 inches, so that the working surface was 5 feet less than that of the common screw, against

which it has been tried; and whereas the common screw weighed 62 cwt. the boomerang was only 26 cwt.

Notwithstanding these adverse circumstances, the average speed obtained in slack water was from 9 knots to 9¼ knots, under a pressure of steam of from 6 lbs. to 9 lbs.; a speed which several scientific gentlemen on board asserted was one knot faster than could have been made by the common screw under the same pressure of steam.

In the course of the afternoon the visitors were entertained to dinner in the first-class cabin, Mr. Lamont, of the firm of Messrs. M'Kean and M'Klarty, occupying the chair. That gentleman, in the course of some observations made after the cloth had been withdrawn, regretted that complete justice had not been done to the boomerang on this occasion, owing to the inability of the engineer to keep the steam up to a fair pressure of 10 lbs. He and the Company he represented were, however, so convinced of the great superiority of the boomerang over the screw, that they were having one of their vessels prepared for the trial of the new propeller in its integrity. Mr. Lamont also referred to the use of English anthracite, in lieu of coals. They had tried it with complete success in the last voyage of the *Livorno*, having found that it was more serviceable, and took up less space. In her previous voyages the *Livorno* required 17 tons of coal, whereas she had only consumed 12 tons 5 cwt. of anthracite. He thought this would create as great a revolution as the boomerang, because, if they could save a quarter of the consumption of fuel, much inconvenience and delay would be prevented. If the *Great Britain*, for instance, instead of consuming 1,500 tons of coal on her passage to Australia, only required 1,000 tons, she could accomplish the whole distance without touching at St. Helena for coals. The gain by anthracite instead of coal would, in his opinion, be about 35 per cent., besides having the gratifying fact that anthracite was not liable to spontaneous combustion.

The Isthmus of Darien Ship Canal. By Dr. Cullen, F.R.G.S. Second edition, much enlarged. Effingham Wilson.

The practical and tangible shape which the enterprise and engineering skill of Sir Charles Fox and his associates in the Darien route project have given to the long contemplated connection of the Atlantic and Pacific Oceans in this region, has attracted to it a degree of interest commensurate with the magnitude of the results which depend upon its execution, and which is amply attested by the appearance of an enlarged edition of Dr. Cullen's account of the subject. As is well known to those who keep their eye on events passing in the great theatres of British industry in distant parts of the world, this gentleman has distinguished himself by the energy and success with which he has prosecuted his explorations on the Isthmus of Darien, and the sagacity which has directed them. Proceeding upon the basis which his comprehensive observations enabled him to form, the survey of the country which has since been made has demonstrated that the undertaking comes fairly within the scope of English capital and skill, while it holds out the prospect of a golden return to the company, and of immeasurable benefits to mankind. The volume in which this great subject is developed to the reader in its numerous bearings and ramifications, is one which, on this account, must be regarded as of considerable interest. Its author, at great cost of literary research, has digested popularly and comprehensively, the history of the great undertaking now about to be fairly carried into practice, and those of the competing schemes which at various times have been launched upon the consideration of the public.

The statement of the views of the parties promoting them, a minute explanation of the engineering features of each, and a fair consideration of their relative merits and demerits, which will be found in its pages, is well worthy of serious attention; as the superior advantages of the Darien route in point of economy of construction and maintenance, facilities of transit and capacity for vessels of the largest draught, salubrity of climate, and other minor natural advantages, will certainly appear from the comparison. In noticing this portion of the subject on a former occasion, we adverted to the chief of these points, and particularly the advantage of the Darien project as regards the total length of the passage from sea to sea, and the comparatively small magnitude of the cuttings which are necessary. Of all the routes which have been proposed, the Nicaragua alone has put forward any pretensions to rival the Darien, but these have been fully disposed of by Sir Charles Fox, whose exposition of the details of the question of engineering facilities must be taken to be definitively conclusive in favour of Darien. His correspondence with the *Times* on the subject, and the articles of the *Times* city correspondent in favour of the Nicaragua route, will be found in an appendix; and Dr. Cullen has thought the subject so worthy of consideration, that he has prepared an analysis of its salient

points, exhibiting the contrast upon each of them in parallel columns. Notwithstanding the legal difficulties which surround the Nicaragua scheme, and which have now removed it from commercial competition, we recommend the consideration of the relative merits of the two, because in doing so the best idea of the substantial nature of the undertaking will be formed.

All the collateral subjects upon which the public now desire to have information,—such as the result in figures of the economy of a cut across the isthmus, the nature and products of the soil, the character of the coast at each end of the line of communication, the number, occupations, condition, and language of the inhabitants,—these, and a number of others are fully gone into, and facts relating to them condensed from a wide surface of information, and arranged in a convenient form for study or reference. Besides an ample account of the towns and villages of the region, full and authenticated particulars are given of minor projected routes and the causes of their inadequacy or failure. The historical part of the subject has also received from Dr. Cullen the great attention which its interest and the instruction it conveys required of him. A particular feature of interest, indeed, which belongs to this book, and second only to the minute and practical examination of the details of the work itself, is the history of the unfortunate Scotch colony established on the coast of Darien, and of the cruel desolation which was made to fall upon it. A valuable appendix is added, which includes a rather copious vocabulary of the Darien language; the valuable engineer's report, made by Mr. Gisborne to Messrs. Fox, Henderson, and Brassey; the prospectus of the "Atlantic and Pacific Junction Company," and some other matters of importance. Upon the whole, Dr. Cullen's book is one in which an unusual amount of interest must necessarily be felt in connection with this vast undertaking, and the public obligation which is due to him for the part he has taken in originating it has been greatly enhanced by his comprehensive, circumstantial, and highly interesting account of the whole subject.

Cyclopædia of Useful Arts. Edited by CHARLES TOMLINSON. Part XXX. George Virtue.

THE terms of high commendation in which, with sincere pleasure, we have spoken hitherto of this popular and elegant exposition of the present and past condition of the arts and sciences, apply most deservedly to the part which has just been issued—No. 30 of the series. Among the very numerous serials of high character for their literary and graphical merits, we venture to say there is not one which more extensively or more effectively inculcates a taste for this study among the middle and the better portions of the industrial community, probably the most useful of any to which their attention could be directed. A series in itself so complete, so amply and so beautifully illustrated, and written with so extensive a knowledge and so just an appreciation of the salient points of each subject, is, indeed, a contribution to our scientific literature which scientific readers should be thankful for.

The present part pursues the alphabet of the arts and sciences from "photography," which is here concluded, to the great subject of "pottery and porcelain;" a great portion of which is disposed of. The art of photography has been treated of at once in a scientific and in a practical manner; the scientific principles of it having been fully explained, and the practical rules stated, which experience has brought us acquainted with, together with the modes of their application, and the requisite cautions to be observed. After this comes the highly interesting subject of "photometry," which is given concisely, yet fully and clearly. The structure of the pianoforte, and the consideration of its numerous details, occupies a large part of the volume, and are illustrated with a great number of engravings well worthy of attention. An article on the pin-manufacture describes fully and popularly every process of that wonderful branch of British industry. Some illustrations of "*pisé-work*," together with an explanation of the principle and mode of structure, will be read with interest. Next we find a useful article, accompanied with numerous illustrations, on planes and planing-machines. "Plastering," "plating," "platinum," and "plumbing," are also very copious in their information. Then comes a very excellent article on potassium, in which the subject is treated of in a manner due to its importance on chemical considerations, and which is well illustrated. The article on "pottery and porcelain," so far as it has proceeded, is exceedingly well presented in its historical aspect, and the account of the materials employed and their mode of treatment. It is also extremely well illustrated. A finely-executed engraving of an oil-mill accompanies the part, which is altogether of a very high character, regard being had to the range of subjects embraced by it.

THE IRON MANUFACTURE AND ITS RECENT IMPROVEMENTS.

The following observations on the iron manufacture are extracted from a Paper "On Iron, and Some Improvements in its Manufacture," which was read at the last meeting of the Birmingham Institution of Mechanical Engineers.

There is no doubt that many most valuable improvements have been introduced (more especially of late years) by ironmasters and others connected with the iron trade; but these have chiefly had reference to the later stages and finishing processes in iron making, and to the machinery connected with these processes. Of the chemistry of the blast-furnace, of the changes produced by the process of refining, and in puddling, we are still ignorant. Having devoted a good deal of time to this subject, the writer may be allowed to say, that the more he has studied it, and the more he has seen of iron making, the more convinced he is of our ignorance; and it is to be hoped that some steps will be taken to improve our knowledge, and render the various processes certain and economical.

The chief varieties of iron ore which are used in this country are the Clay-band, the Black-band, and the Hematite. From the Hematite the purest pig-iron and strongest bar-iron are said to be made; and from Clay-band a stronger malleable iron is generally supposed to be obtained than from the Black-band; but the various qualities can be altered by the judicious ironmaster, and malleable iron of as good quality can be produced from Black-band as from the Hematite or Clay-band. The writer does not here allude to improvement of quality by mixing different ores (by which, it is well known, the bad qualities of some descriptions are entirely removed), but to the skilful treatment of one or more ores of a somewhat similar character.

The first stage in the manufacture of iron is the conversion of the ore into cast-iron, which is accomplished in various ways. In Great Britain, the ore, after being calcined, if necessary, is introduced with layers of coal or coke, and a flux (usually a carbonate of lime), into a large furnace, and a strong blast (either hot or cold) is urged through the previously kindled mass, to accelerate the combustion of the fuel, and the conversion and fusion of the metal, which is usually tapped from the furnace once in the twelve hours, and run into pigs or ingots, which go by the name of "hot or cold-blast iron," according to the nature of the blast employed. The subdivisions of both these sorts of iron are the same, viz., Nos. 1, 2, and 3, when for foundry purposes, and forge or white iron when intended for being converted into malleable iron; these numbers and qualities of iron are supposed to differ from each other in the quantity of carbon contained in each, although this is doubted by many eminent chemists. No. 1 is certainly darker, softer, and more carbonaceous-looking than the other numbers, and forge or white iron appears to contain very much less carbon than any iron intended for foundry purposes; but, as we see a similar effect produced on foundry iron by rapid chilling to that produced in forge iron by the supposed abstraction of carbon, it will, perhaps, be more readily admitted, that colour is not a test (or, at least, not a certain one) of the quantity of carbon which iron contains.

This mode of producing strong castings has been long practised, and is, in many places, convenient; and the increase of strength is no doubt satisfactory, but there is still a want of uniformity in result, and an occasional difficulty in keeping to the proportions, and even in obtaining the brands specified by the engineer or architect, or chosen by the founder on his own experience.

Allusion has already been made to the different numbers of cast-iron, and to their qualities; and it ought further to be stated, that No. 1 is considered the weakest, and No. 3 the strongest. To render these uniform in strength, and at the same time to equalise *that of cast-iron from different districts*, it is only necessary to vary the quantity of wrought-iron introduced, by which means all other mixture is avoided, and so much greater strength insured, as to allow a margin for considerable variation in strength, from any accidental defect, as well as for a diminution in weight, taking the averages of the toughened cast-iron and of the best mixtures.

Transverse strength of bars, 1 inch square, 4 feet 6 inches between supports.

Cast-iron, average breaking weight 436 lbs.
Toughened cast-iron, ditto .. .. 733 „

[The averages of the transverse and tensile strengths are from the experiments of Mr. Hodgkinson, in the Government Report and elsewhere, and other experimenters; Mr. Hodgkinson is the sole authority for the resistance of crushing force.]

Tensile strength.

Cast-iron, average breaking weight.................. 7·036 tons.
Toughened cast-iron, ditto .. 11·790 „

Crushing strength.

Cast-iron, average crushing weight.................. 38·582 „
Toughened cast-iron, ditto .. 59·522 „

To render the above more intelligible, the

proportions are given below, which have been found to bring very soft Scotch (No. 1) hot-blast), and very hard Welsh (No. 2 cold-blast), to nearly the same strength.

Scotch, No. 1 hot-blast, breaking when unmixed at .... 430 lbs.
With a mixture of 33 per cent. of wrought-iron scrap, broke at .. 713 „
The same Scotch iron as the first, with only 20 per cent. of malleable scrap, broke at about ... 620 „
Showing a deficiency in the quantity of the scrap.

Welsh, No. 2 cold-blast, breaking when unmixed at .... 440 „
With a mixture of 10 per cent. of wrought-iron scrap, broke at .. 689 „

The results obtained by Mr. Hodgkinson are very favourable, as shown in the following Table, where the breaking weights of common cast iron and toughened cast iron are given from the Report of the Commissioners appointed to inquire into the strength of iron:

Table of Comparative Strength of Cast Iron.

Description of Iron Bars, all two inches square.	Transverse Breaking Load in Centre.	Tensile Breaking Strength.	Crushing Strength.
Toughened Cast Iron, with 20 per cent. wrought scrap.	lbs. 2174	Tons per inch. 11·50	Tons per inch. 54·64
Low Moor, No. 1	1207	5·67	27·00
Blaenavon, No. 2	1220	7·46	49·11 / 30·50
Warrington best Gun Mixture	1375	—	—

Since these experiments and trials were made, the toughened cast iron has been successfully used in the construction of several public works, Windsor-bridges, Chelsea-bridge, Yarmouth-bridge, &c., &c.; and it may be mentioned that by being allowed to reduce the scantling in proportion to the increased strength gained by employing the toughened cast iron, the contractors for the heavy castings of the Manchester Viaduct were enabled *profitably to fulfil* their contract, whereas had they used common iron, and been confined to the specification, they would have been heavy losers.

For shafting, rolls, pinions, cog-wheels, cast-iron railway-carriage wheels, cylinders, and other castings where strength and closeness of texture are desirable, the toughened cast iron will be found most useful; also, cast iron which will not chill in its unmixed state, readily chills with less loss of strength than usual, when mixed in proper proportions with malleable iron.

Before proceeding to touch on certain other processes which the writer believes to improve iron for special purposes, it may be well to point to some alloys of cast-iron, as the making these led him to make the addition of the same and other metals to wrought-iron.

The first is an alloy of iron and tin, which is extremely hard, sonorous, and capable of receiving a very high polish; the addition of manganese, and a very small per-centage of zinc, gives somewhat greater tenacity. Bells made of these alloys have a pure and clear tone. Cast-iron will take up from 20 to 25 per cent. of tin.

Cast-iron alloyed with zinc becomes closer in his texture, and, as far as the writer's experiments have yet gone, stronger, and not less malleable. Alloys of bismuth, antimony, copper, and silver, possess some scientific interest, but it would be out of place to touch on them now.

Having observed the hardening effect which tin produces upon cast-iron, the writer tried a similar mixture in the puddling furnace, and found a corresponding result, with this essential difference,—that whereas cast-iron will take up about a fifth of its weight, wrought-iron is rendered too hard for subsequent working by any quantity exceeding one per cent.; and taking the various descriptions of iron (Staffordshire, Scotch, and Welsh), one-half per cent. of tin produces a description of iron crystalline, close in texture, and harder than common wrought-iron.

This quality of iron appeared to be suitable for the wearing surfaces of rails, and tires of wheels, and subsequent trials which have been made have fully confirmed this opinion. Lamination is prevented, and the rail, when properly made, wears smoothly and evenly. As in all iron, and particularly in rails, much depends on manufacture; but points and crossings made of this hardened iron, and rails upon sharp inclines, where the wear previously had been

very rapid, have been found to last more than double the time of any rails previously tried, and as they are yet not worn out, it is at present impossible to say how much longer they will last. The writer does not believe their increased duration to arise solely from the *greater hardness*, but more from the peculiar crystaline texture and fine grain of the iron resisting the lamination, which great speeds and heavy engines so rapidly produce.

The writer was much gratified to observe in the American Department of the Great Exhibition, a confirmation of his experiments on this subject. Iron, naturally cold-short and red-short, being rendered free from each of these qualities by the addition of an ore of zinc; samples in all stages of progress were exhibited.

Table of Comparative Strength of Wrought Iron.

Description of Iron.	Tensile Breaking Strain.	Deflection with Strain of 9½ cwt.	Permanent Set, in lengths of 2¼ feet.	Final Stretch in length of 2 feet.
	Tons per. in.	Inches.	Inches.	Inches.
Hardened Wrought Iron, with ⅔-rds per. cent. Tin.	22·92	1·42	1·02	¼
Toughened Wrought Iron ..	27·81	—	—	—
Dundyvan best Bar......—	24·33	2·02	1·60	3½
S. C. Crown average result..	24·47	—	—	—
Hartley's general average of Bar Iron	23·33	—	—	—

Had the limits of a mere sketch like this permitted, the writer would have entered on the consideration of the relative qualities of cold and hot-blast iron, and of the effects produced by the use of cinder; also on some combinations of iron with the earthy bases, and on the effects of various salts and fluxes in the blast and other furnaces. Several other alloys of iron possess considerable interest; and, in conclusion, allusion may be made to a remarkable property which iron possesses of closing the grain of other metals and alloys to which it is added in minute quantity.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING APRIL 7, 1853.

Jacques Leon Tardieu, of Paris, gentleman. *For certain improvements in the colouring of photographical images.* Patent dated September 23, 1852.

The new process of colouring photographs, specified under this patent, which the inventor terms "tardeochromy," is applicable only to such photographic pictures as are taken on transparent paper,or on glass, or other transparent material. It consists in applying oil or other colours at the back of the picture, so as to give the requisite tints to the several parts of the photograph, without at all interfering with the extreme delicacy of effect which characterizes this class of productions. The painting will, of course, require to be performed by an artist; and it may even, in some cases, be used to remedy defects in the photographic image.

The claim is essentially for the application of colours at the back instead of on the surface of photographic pictures, whatever kind of colours may be employed.

John Lawson and Edward Lawson, both of Leeds, machine makers. *For improvements in machinery for scutching and cleaning flax straw.* Patent dated September 23, 1852.

The novelty of the improved machine which forms the subject of this patent consists in the employment of two or more pairs of ribbed and grooved rollers working into each other, the distance between which is capable of being adjusted so as to exert a greater or less pressure, as required, on the flax, which is held in holders arranged to rise and fall and traverse lengthwise of the rollers, in the same manner as in heckling machinery.

The claim is for the combining of ribbed and grooved rollers working into each other, and moving at a greater speed than the flax straw.

FRANCOIS MATHIEU, of Hatton-garden, gentleman. *For improvements in apparatus for containing, aërating, refrigerating, filtering and drawing off liquids, and in ornamenting such apparatus.* Patent dated September 23, 1852.

The patentee describes and claims,

1. A system or mode of refrigerating liquids, wherein the chamber or receptacle containing the ice or refrigerating mixture is not actually brought in contact with the sides of the vessel which contains the liquid to be refrigerated.

2. A peculiar construction and arrangement of aërating tubes.

3. The protecting and ornamenting of glass or other fragile vessels by a metallic coating deposited by the electro-galvanic process.

4. A peculiar arrangement and construction of stop-cock for "lavoirs" and other vessels, wherein the contact of the vessel to be filled effects the flow of the liquid.

5. An arrangement whereby the cock is closed by the weight of the vessel when filled.

6. A peculiar arrangement and construction of stop-cock and of filter.

ROBERT BOWMAN TENNENT, of Gracechurch-street, merchant. *For certain improvements in the mode of pulping cherry-coffee, and in the machinery applicable thereto.* Patent dated September 24, 1852.

The object of this improved machinery is to effect the separation of the coffee-bean from its husky covering, without the crushing or injury to the former which frequently results in the ordinary construction of pulping mill.

The patentee employs for this purpose two rollers revolving almost in contact with each other, but in opposite directions, and at different speeds, between which the cherry-coffee to be treated is fed in along with a stream of water. The rollers have their surfaces formed so as to resemble graters, and just below their centres there is placed between them a plate of iron with a bevilled edge, called the "chop," between which and the roller whose speed is the slowest, the beans fall into receivers placed for them, while the husks removed are carried round and delivered separately by the other roller. The surfaces of the rollers are arranged with hollows in them to carry off the slime from the husks which would otherwise be apt to clog them. The parchment beans are further cleansed after their removal from the husks, by passing them between rollers or cylinders covered with card-teeth or brushes, which are caused to revolve almost in contact and in opposite directions.

The patentee describes also a modification of the ordinary pulping-mill, and a variety of arrangements on the same principle as that first described; and these arrangements together constitute the subject matter of the claims.

HENRY MEDHURST, of Clerkenwell, Middlesex, engineer. *For improvements in water-meters, and in regulating, indicating, and ascertaining the supply of water and liquids.* Patent dated September 27, 1852.

Mr. Medhurst describes and claims:

1. An improved construction of water-meter, a full description of which will be found in another part of our present Number, (*ante* p. 281.)

2. An arrangement of apparatus for regulating, indicating, and ascertaining the supply of water and liquids.

MOSES POOLE, of London, gentleman. *For improvements in the manufacture of combs.* (A communication.) Patent dated September 30, 1852.

This invention, which is a communication from Mr. Goodyear, of New York, consists in manufacturing combs from the horny substance produced by combining sulphur with caoutchouc, and submitting the same to heat.

The manufacture of this compound formed the subject of a patent granted to Mr. A. V. Newton, March 4, 1851, (see vol. lv. p. 219), on behalf of Mr. Goodyear, and its novel application to the use mentioned in the title, is the subject now sought to be protected.

Claim.—The manufacturing of combs by the application in such manufacture of the hard substance resembling tortoise-shell or ivory, produced by combining sulphur with caoutchouc, and submitting the same to heat.

EDOUARD MORIDE, of Nantes, France. *For certain improvements in tanning.* Patent dated September 30, 1852.

These improvements consist in employing the apparatus known as the ooze cylinder, in the preparation of the oozes used for tanning in a cold state, and without exposure to the atmosphere.

The substance from which the ooze is to be prepared is placed in the cylinder on a perforated diaphragm, and water is admitted so as to cover it and fill the cylinder. Steam, at a pressure of two to three atmospheres, is then admitted to the interior of the cylinder, by which the water will be displaced, carrying with it in solution a portion of the active properties of the bark or vegetable matter, and this operation is repeated until the bark is exhausted. As each succeeding solution will decrease in strength, they are received into separate

vessels, from which they are run off as required into the pits or vats in which the hides to be tanned are placed.

Claim—The application of the apparatus described for the preparation of the oozes employed in tanning.

Sarah Lester, of St. Peter's-square, Hammersmith, sole executrix of the late Michael Joseph John Donlan, of Rugeley, Staffordshire, gentleman. *For improvements in treating the seeds of flax and hemp, and also in the treatment of flax and hemp for dressing.* (A communication from the said M. J. J. Donlan.) Patent dated September 30, 1852.

The *first* part of this invention consists in covering the seeds of flax and hemp with an oily mixture, in order to promote vegetation.

The *second* part consists of a method of preparing flax and hemp for dressing, by subjecting it in a dry state to a succession of machines arranged for breaking and crushing the straw, and then impregnating it with an oily compound.

PROVISIONAL PROTECTIONS.

Dated January 31, 1853.

264. Charles Cattanach. Certain apparatus for measuring the human figure, and transferring the said measurement to cloth.

Dated March 14, 1853.

633. The Right Hon. Charles Augustus Lord Howard de Walden and Seaford, G.C.B., Her Britannic Majesty's Envoy Extraordinary and Minister Plenipotentiary at the Court of Belgium. Whitening and cleansing sugar by the application of steam and hot air in a centrifugal sugar-machine. A communication from Victor Van Goethm, of Bruxelles.

639. John Scott, junior. Improvements in the treatment or manufacture of animal charcoal.

641. William Bashall, junior. Improvements in dressing, sizeing and tape-machines.

Dated March 15, 1853.

643. Thornton John Herapath. Improvements in treating sewage and in manufacturing manure therefrom.

645. François Durand. An improved kind of loom.

647. Perceval Moses Parsons. Improvements in working the valves of steam engines.

Dated March 16, 1853.

649. George Knight and John Heritage. An improvement or improvements in drying bricks and such other articles as are or may be made of clay.

651. Charles Heard Wild. Improvements in fishes and fish-joints for connecting the rails of railways.

653. Henry Richardson Fanshawe. Improvements in fire-arms.

655. John Oliver. Improvements in the manufacture of a red pigment, commonly called Venetian red.

Dated March 17, 1853.

657. John Livesey. Improvements in pile and looped fabrics, in cutting and finishing such fabrics, and in the machinery employed therein.

659. William Blinkhorn. Certain improvements in the construction of furnaces and annealing kilns employed in the manufacture of glass.

661. James Roscow and Robert Bullough. Certain improvements in machinery or apparatus for raising water and other fluids.

662. John Bottomley. Improvements in the manufacture of figured or ornamented piled or plushed fabrics.

Dated March 18, 1853.

663. Richard Peters. An improved machine for mortising and tenonting, drilling and boring.

664. James Tweedale, Abraham Alfred Tweedale, and Samuel Tweedale. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

665. Paul Cameron. Improvements in marine and surveying-compasses.

666. William King Westly. An improved comb or gill for heckling, drawing, roving, or otherwise preparing to be spun hemp, flax, tow, silk, wool, and other fibrous substances.

667. John Henry Johnson. Improvements in steam engines. A communication.

668. Malcolm Baxter. Improvements in steam engines and pressure-regulating valves.

669. Richard Archibald Brooman. An improved machine for weighing or measuring and packing spices, drugs, coffee, and like matters. A communication.

670. Auguste Edouard Loradoux Bellford. Improvements in power looms. A communication.

671. John Haskett. Improvements in grinding stones and whetstones. A communication.

673. Charles Harratt. Improvements in strengthening the masts of ships and vessels.

674. Robert Oates Christian. Certain improvements in bed-hangers for ships carrying emigrant passengers, and in the manner of manufacturing them.

675. Robert Oates Christian. Certain improvements in ventilating.

676. Alfred Warn Banks. Improvements in the manufacture of life-belts.

677. George Ross. An improved manufacture of lubricating oil, and a mode or modes of applying such oil to the purposes of lubrication. A communication.

678. George Mackay. Improvements in the manufacture of iron. A communication.

679. Robert Bowman Tennent. An improvement in the machinery employed for pulping coffee. A communication.

Dated March 19, 1853.

680. John Eldridge. Washing woollen, linen, cotton, silken, hempen, skin, and flaxen materials and substances, and called "the rotary washing-machine."

681. Joseph Haley. Improvements in the method of transmitting communication from one part of a railway train to another.

682. Henry Bousquet. Improvements in the manufacture of manure.

683 George Dalton. Certain improvements in smelting or reducing iron ore, iron stone, or slag or scoria.

684. John Henry Johnson. Improvements in regulating steam engines and other prime movers. A communication.

685. Samuel Radcliffe and Knight William Whitehead. Certain improvements in machinery or apparatus for grinding or setting the surfaces of cylinders and rollers employed in carding-engines.

686. Alfred Vincent Newton. An improved construction of oil-lamp. A communication.

Dated March 21, 1853.

687. James Fraser. Improvements in the manufacture of portable packages.

688. William Whitaker Collins. Certain improvements in looms for weaving. A communication.

689. Thomas Sykes. Improvements in the treatment of soapy and greasy waters. A communication.

690. Moses Poole. Improvements in generating steam and other vapours. A communication.

691. Jean Marie Durnerin. Improvements in apparatus for extracting liquid out of solid substances, specially applicable to the treatment of fatty matters.

692. Moses Poole. Improvements in obtaining power where air is employed. A communication.

693. Isaac Taylor. Improvements in machinery for printing woven and other fabrics.

694. John Barsham. Improvements in apparatus for communicating between the guard and engine-driver or other persons in a railway train.

695. John Brett. An improved portable sketching-apparatus for artists.

696. John Stather. Improvements in printing.

Dated March 22, 1853.

697. Edwin Maw. An improvement in the mode of connecting sheets of corrugated iron when used in the construction of roofs, iron houses, and other purposes.

699. Thomas Bouch. Improvements in signals.

700. John Henry Johnson. Improvements in the mode of smelting iron and other ores. A communication.

701. William Johnson. Improvements in rolling and shaping malleable metals. A communication.

702. Nicholas G. Norcross. Certain improvements in machinery for planing or reducing boards or timber.

703. Frederick Futvoye. An improved apparatus to be employed in games of chance.

704. Henry Henson Henson. An improvement or improvements in buffers.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 1st,* 1853.)

688. George Shadforth Ogilvie. Improvements in candlesticks and lamps.

693. William Tudor Mabley. Improvements in ornamenting glass and other transparent or partially transparent substances for windows and for other purposes.

(*From the "London Gazette," April 5th,* 1853.)

591. George Evans. An improved gridiron.

637. William Pope. Improvements in the ventilation of ships.

641. Collinson Hall. An apparatus to be used in the carriage of solid and liquid bodies.

717. William Davis. Improvements in machinery for cutting tiles.

809. William Green. Improvements in the manufacture of textile fabrics, and in machinery or apparatus for effecting the same, parts of which improvements are also applicable to printing and embossing generally.

847. Henry Thomson. Improvements in apparatus to be used in dyeing, bleaching, and other processes, in which goods are operated upon in the piece.

853. Stephen Spalding. An apparatus or machine for the manufacture of pantiles used in building purposes.

890. Marthurin Jean Prudent Moriceau. Improvements in sharpening and dressing the cards of carding-machines and the clippers and cylinders of shearing-machines.

953. Richard Archibald Brooman. Improvements in the manufacture of sugar.

992. John Browne. Improvements in machinery or apparatus for preventing the escape of smoke from chimneys, and consuming or otherwise disposing thereof.

1143. Alexandre Deutsch. Certain improvements in treating oil of colza and similar oils.

461. Asa Willard. Improvements in machines for manufacturing butter, to be called "A. Willard's Butter-machine."

463. John Green. The more economic, speedy, convenient, and in every respect superior system of cooking to any now in use, and which he designates "Green's Economical Self-basting Cooking Apparatus."

500. Martyn John Roberts. Improvements in the manufacture of mordants or dyeing materials, which are in part applicable to the manufacture of a polishing powder.

561. John Hirst, junior, and William Mitchell. Improvements in stretching fabrics.

568. Godfrey Simon and Thomas Humphreys. Improvements in carriages.

570. Joseph John William Watson. Improvements in illuminating apparatus, and in the production of light.

608. John Powis and Jabus Stanley James. Improvements in machinery for slotting, tenoning, morticing, grooving, drilling, boring, and vertical planing.

620. John Gilby. Improvements in fire-arms.

630. Robert Christopher Witty. Improvements in the manufacture of gas.

631. James Murdoch. An improved construction of portable voltaic batteries. A communication.

643. Thornton John Herapath. Improvements in treating sewage, and in manufacturing manure therefrom.

651. Charles Heard Wild. Improvements in fishes and fish-joints for connecting the rails of railways.

655. John Oliver. Improvements in the manufacture of a red pigment, commonly called Venetian red.

657. John Livesey. Improvements in pile and looped fabrics, in cutting and finishing such fabrics, and in the machinery employed therein.

659. William Blinkhorn. Certain improvements in the construction of furnaces and annealing kilns employed in the manufacture of glass.

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690. Moses Poole. Improvements in generating steam and other vapours. A communication.

691. Jean Marie Durnerin. Improvements in apparatus for extracting liquid out of solid substances, specially applicable to the treatment of fatty matters.

692. Moses Poole. Improvements in obtaining power when air is employed. A communication.

693. Isaac Taylor. Improvements in machinery for printing woven and other fabrics.

696. John Stather. Improvements in printing.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

ENGLISH PATENTS SEALED UNDER THE OLD LAW.

Joseph Gibbs, of Devonshire-street, Middlesex, civil engineer, for improvements in the treatment of metals and metalliferous ores. March 21; six months.

WEEKLY LIST OF PATENTS.

Sealed April 1, 1853.

1852:

26. John Macintosh.
50. Walter Henry Tucker.
73. Edward Wilkins.
82. Henry Mortlock Ommanney.
83. Henry Mortlock Ommanney.
89. James Nichols Marshall.
131. Henry Mortlock Ommanney.
132. Henry Mortlock Ommanney.
133. Henry Mortlock Ommanney.
134. Henry Mortlock Ommanney.
205. Martin Billing.
239. Pierre Frederic Gougy.
254. Robert Shaw.
264. Alfred Vincent Newton.
283. Thomas Greaves.
289. John Tatham and David Cheetham.
299. Thomas Pascall.

Sealed April 2, 1853.

1852:

319. James Johnson.
359. Léon Godefroy.
362. William Tatham.
394. Adolphe Nicole.
465. Joseph Cundy.
458. Peter Evans Donaldson.
492. John Holmes.
494. Philip Berry.
548. William Thorp.
736. Somerville Dear.
1155. Joseph Burch.
1156. Joseph Burch.
1157. Joseph Burch.

1853:

69. Joseph Beattie.
368. Robert Davis Rea.

Sealed April 5, 1853.

1852:

227. Benjamin Mitchell.
288. Augustus Waller.
302. William Townley.

Sealed April 6, 1853.

1852:

284. George Simpson.
324. Thomas Restell.
329. Auguste Edouard Loradoux Bellford.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Mar. 24	3435	J. J. Catterson	Islington	Carriage-spring.
30	3436	D. J. L. B. Vandenborch	Bruxelles	Extending table.
,,	3437	W. Duck and W. Wilson	London-road	High-pressure cock.
31	3438	W. J. Clapp	St. James's	Hollow & solid bullet-mould.
,,	3439	J. Cawood and J. Sunter	Derby	Valve-lever and ferrule.
,,	3440	J. Skudder	Deptford	Gold-diggers' dwelling.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

Mar. 29.	498	F. H. Elwin	Camden-town	Gun and shot.

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Mechanics' Magazine.

No. 1549.] SATURDAY, APRIL 16, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

ANDREWS' PATENT CUTTING AND STAMPING-MACHINE.

Fig. 1. Fig. 2.

ANDREWS' PATENT CUTTING AND STAMPING-MACHINE.

(Patent dated October 7, 1852.)

THE machinery represented in the accompanying figures has been invented and patented by Mr. Solomon Andrews, of Perth Amboy, United States. It admits of immediate application to an extensive variety of useful objects in the arts, amongst which are the cutting, punching, stamping, forging, and bending of metals, the driving of piles, and the crushing and pulverizing of ores. From the following description of the machinery, its construction and operation will be readily comprehended; and it will also be seen, that with its aid, a piece of metal of any required size may be cut off, forged, punched, stamped, and finally delivered in the form of a nut.

This particular application of the machinery is exhibited in the figures. Fig. 1 is a front elevation, fig. 2 a side elevation, and fig. 3 a plan of the machine. A is a heavy base-block of metal, to which are firmly secured the perpendicular standards, B B. These standards support at top the crosshead, C; D is the hammer, the lower part of which has two lugs, *a a*, cast upon it so as to slide up and down upon the two guide-rods, E E. The hammer, D, is continued upwards for a considerable length, and passes through a hole in the crosshead, C, and has a number of teeth formed upon it, similar to a rack, and into which gears a strong pinion, H, which is centred upon the shaft, G, turning in plummer-blocks, *b b*, on the two standards, B B. The pinion, H, revolves freely on the shaft, G, but one side of its boss has teeth, into which those of a clutch, I, take. This clutch revolves with the shaft, G, but has a lateral motion imparted to it in the following manner:—K is a forked lever, which embraces the clutch, I, and is attached to the back framing of the machine. L is a rod, which slides through the crosshead, and has formed upon it a wedge, *c*, which, when it comes in contact with the tail of the lever, K, throws the clutch out of gear with the pinion, H. M is a spring, one end of which is fixed to the standard, B, while near the other end it bears against the lever, K, to throw the clutch again into gear when released from the action of the rod, L. The rod, L, and spring, M, are united at top by a link, *d*, which not only serves the purpose, when the rod L is lifted, of releasing the spring from the lever, K, but also causes the spring to act upon the rod, L, and throws the clutch, I, clear of the pinion. N is a sliding bolt, kept in gear with the teeth on the hammer, D, by a spring of vulcanized India-rubber. O is a rod, hinged at its lower end to a treadle P. The upper part of this rod passes through a slot in the sliding bolt N, and has formed upon it a wedge, *e*, so that when the treadle is depressed by the foot of the operator, the wedge, *e*, coming in contact with the sliding bolt, N, liberates it from the teeth on the hammer, D, and so allows it to fall upon the block, A. Q is the lower die, which is let into the upper face of the block, A; and R is a bolster, the centre part of which is so made as to form the three sides of a nut. S is the upper die, which slides up and down upon the rods, T T. This die is furnished in front with a shear or cutting edge, *g*, which, when down upon the lower die, forms the fourth side of the square, cutting off at the same time a piece from the end of a flat bar of iron previously placed upon the lower die, corresponding to the shape of the dies and the intended nut. U is a punch, screwed into the under side of the lower end of the hammer, D, for punching a hole through the centre of the nut. The centre of the upper die has a hole formed in it to allow of the punch passing through. V V are two rods, which pass through the block, A, and W W two spiral springs acting against collars, *h h*, and the cross-piece, *x*, and supporting the top die. A trigger may be placed at the back of the machine, to throw off the nut after it has been stripped from the punch by the upper die. Y is the driving-pulley, and Z the fly-wheel; and *i* is a guide for placing the bar of iron in the exact position between the dies.

The action of the machine is as follows:—The driving-pulley, Y, is made to revolve by a driving-belt, whereby motion is communicated to the shaft, G, and clutch, I. The clutch, I, being thrown into gear with the pinion, H, by means of the spring, M, causes it to revolve, and the teeth of the pinion gearing into the teeth on the hammer, raise it, when the part *k* comes in contact with the lower end of the rod, L, and forces it upwards, until the wedge, *c*, strikes the tail of the forked lever, *k*, releases the spring, M, and, in conjunction with the link, *d*, throws the clutch, I, well out of gear. The workman, during the rising of the hammer, places the end of a bar of iron between the dies, then placing his foot upon the treadle, liberates the sliding bolt, N, and allows the hammer to come with its full force down upon the upper die, which cuts off a piece from the end of the bar, and thus at the same time punches the hole and forms it into the shape of the intended nut. The bar out of which the nuts, &c., are to be formed, may be placed in the machine

either in a heated or in a cold state; though the patentee prefers the former, as being best adapted for the purpose.

The falling of the hammer by means of the projecting pin, m, which strikes the top of the rod, L, and causes it to be forced downwards, liberates the spring, and throws the clutch, I, into gear, when the hammer is again instantaneously raised, and the workman places the bar between the dies, the nut previously formed having been removed by the trigger, and the operation is repeated in quick succession.

Fig. 3.

In order to prevent the punch from being heated, which would destroy its effective working, the hammer is made hollow, as indicated by the dotted lines. The punch is also made hollow to within about a quarter of an inch of the end, and communicates with the hollow in the hammer, which is filled with water. The upper part of the hollow is stopped to prevent the fluid from being thrown out with the blows of the hammer. Where a punching tool is used in any other machine for punching or working hot metal, it should be made hollow, so as to contain sufficient fluid to enable it to remain at a low temperature.

To adapt this machine to forging and bending metals, the same arrangement of the machinery is employed, but with the necessary modification in the tools or dies. For crushing and pulverizing ores and other hard substances, and also for driving piles, the machine is to be modified by substituting a rope or chain, attached to the lower end of the hammer, and made fast at top to a cord-wheel on the shaft, G.

INSTITUTION OF CIVIL ENGINEERS.

In consequence of an unusual pressure of matter, we were unable in our last Number to give Mr. Sewell's excellent paper "On Locomotive Boilers," which was read at last week's sitting of the Institution of Civil Engineers: and for the same reason we regret to be obliged to continue another week in arrear.

The chair was taken by Robert Stephenson, Esq., M.P., Vice-President.

After showing the theoretical and practical evaporative value of coal and coke, at different pressures, and the various results under stationary boilers and in locomotive boilers, and with slow or quick combustion, a series of tabulated results was given, showing that estimated by the value of the fuel, the best locomotive boiler exceeded the Cornish boiler by about 2 per cent. in evaporative economy; but ordinary locomotive

boilers were from 4 to 10 per cent. below the Cornish standard of 10½lbs. of water evaporated by 1 lb. of Welsh coal.

Evaporative economy was shown to follow the increase of the tubular ratio of the heating surface of the long-tubed boilers, but it was urged, that, in practice, evaporative rapidity was as essential as economy of fuel alone, and the Great Western boilers were referred to, as efficient examples in this respect. The rate of combustion, the time of the heat remaining in the boiler, and the number of draughts of steam from the boiler, were shown to be 25 per cent. in favour of boilers mounted on wheels of 8 feet diameter, over those on wheels of 6 feet diameter, for economy of fuel and for pure steam to the cylinders. Evaporation, apparently good, not unfrequently proved indifferent, on account of priming, as a diminished duty frequently demonstrated. The influence of load and velocity on the consumption of fuel was referred to, as defeating any economical comparison between engines maintaining a speed of 50 miles per hour, and those which only reached a speed of 30 miles an hour.

The recent experiments on the London and North Western Railway were referred to, as showing that the present form of locomotive boilers might be departed from, without evaporative loss, to gain the constructive facilities of a low boiler with high wheels and inside cylinders; and the new shortened boiler was stated to have realized the full average evaporative economy of locomotive boilers, or from 7½ lbs. to 8½ lbs. of water by 1 lb. of coke. The advantages of a larger proportion of water evaporating surface to the total water in the boiler, the shorter ascent of steam from the lower tubes to that surface, and the greater proportion of the heat passing through tubes, nearer the evaporating surface, were referred to, as being in favour of small boilers, with the fewest rows of tubes, generating most steam per square foot of the total heating surface. It was suggested, that vertical rows of tubes, with free vertical steam passages between them and the largest practicable water surface, so much valued for stationary boilers, might merit a trial in the large locomotive boilers, and might place them on a level with the smaller boilers, in evaporative rapidity per square foot of heating surface. The want of a more homogenous structure for locomotive boilers was referred to, in order to safely resist the expansion and contraction which now fell on particular parts only, and ultimately injured the cohesion of the metal at those parts.

Explosions of boilers were noticed as frequently occurring when either the safety valve or the regulator was opened, and it was suggested that this might be due to the sudden disturbance of the pressure of the elastic force tending to one point, and momentarily increasing the pressure at that point, from the effect of which the boiler might burst, even with the safety valve in good order. The apparent effects, after explosion, would not be then due to the pressure only, but to the sudden release of the whole elastic force, which, like any other spring, would exert a force beyond its quiescent limit. The rare occurrence of goods, or slow trains leaving the rails without known cause, was proof that Mr. George Stephenson adopted a flange sufficiently deep for the speed of 15 miles or 20 miles per hour, originally contemplated on the Liverpool and Manchester Railway; but the frequent running off the rails, of fast trains, suggested the trial of deeper flanges on the wheels; and it was hoped they would have the effect of adding to public safety and to railway economy.

The discussion of Mr. D. K. Clark's Paper, "On the Principles of Locomotive Boilers," was resumed.

It was contended, that the same kind of economy which had been introduced into the making of iron, by the use of the developed carbonic oxide, might be adapted to the locomotive boiler, in which, it was asserted, there was now a loss by the chimney of nearly 20 per cent. of the fuel. It was not to be supposed that the proportions of the new boiler were perfect, or that the results already obtained were as good as could be expected; on the contrary, further experience only demonstrated the advantages to be expected from a more careful investigation of the question, and therefore the proposed trial of the new boiler and engine, against any one or two other engines, under the circumstances proposed at the last meeting, was strenuously insisted upon. The mere evaporation of water was considered to be a fallacious test; and the fact of the experiments in the "Heron" being commenced, with the water, in the tender, at a high temperature, might be said to have vitiated the truth of the result, as the difference of bulk due to the temperature of the water, had not been taken into consideration. It was admitted that the pressures in the boilers of the two engines, in the trial against the new engine, had not been noticed; but it was presumed they worked up to as high a pressure as they would bear.

In answer, it was reiterated, that to enable a correct opinion to be formed, all the circumstances of the experiments should have been given; that the tabular statements had

been analysed, and been shown to be deficient in accuracy; and that it was not enough to suppose the two engines to have "done their best," as the absolute pressure should have been given, to enable correct comparisons to be made.

With respect to the chemistry of the question, there was no doubt that the carbonic acid—the normal product of combustion — did seize an equivalent of carbon, from the incandescent coal or coke, and took it away as carbonic oxide, in which form no available heat was developed; if this carbonic oxide could be advantageously used, it would doubtless be productive of economy of fuel. But the practical question rested on other grounds. There was still a wide difference between the theoretical calculations of chemists, and the practical results arrived at by engineers. Thus, one pound of coal was supposed, theoretically, to be capable of raising 10 or 12 millions of pounds of water, one foot in height; whereas the results of the best Cornish engines showed the practical effect to be only about 1 million pounds. Again, by theory, one pound of coal should evaporate nearly 14 lbs. of water, whilst practically, under favourable circumstances, only about 11 lbs. were evaporated. Whilst this discrepancy between theory and practice existed, it was useless to examine the question otherwise than practically, and therefore the proposed trial should be made.

The importance of the analysis of the gases in the smoke-box, was strongly urged, as a means of ascertaining whether the waste of carbonic oxide was most affected by slow or by rapid combustion, or with long or short tubes; there was reason to apprehend, that with a thick fire, the carbonic acid, passing through the fuel, conveyed away, wastefully, a large portion of the, otherwise useful, carbon. It was argued, that the proof of the practically complete combustion of coke, in the fire-box, founded on the observed evaporative performance of the fuel, and the heat-properties of the gases of combustion, was as valid and certain as any that could be derived from a chemical analysis of the gases. The subject of the combustion of coal was treated with indifference, as coal was considered as the mere ore, from which coke was extracted; and it was anticipated, that by judicious treatment, various marketable products, now dispersed in the coke-oven, would ultimately be preserved, and would fetch a price, sufficient to reduce the cost of coke to an equality with that of coal. It was contended, that the expansion of the water in the tender, by heat, was practically insignificant, being only one-half per cent. at 90°, of the volume at 60°, and just one per cent. at 120°, and that, therefore, the measurement by volume of the water in the tender, was substantially correct, at all ordinary temperatures. Also, that the mean level of the water, notwithstanding fluctuations, might be closely approximated to, and that the average of a great number of such observations, must be substantially correct. It was further shown, that the assumption of a central inert core of hot gas, in the larger tubes, was totally erroneous; but that in reality, the smoke curled along the inside of the tubes, bringing the hot particles to impinge on the upper surface in continuous succession.

Though the applicability of the formula to marine and stationary boilers had not been claimed, yet it did apply, with remarkable exactness, to the results of the performance of marine boilers; and it might be assumed, that some modification of the coefficient, was all that was likely to be wanted, for the proper adjustment of the formula to other kinds of boilers. It was particularly explained, that in the construction of the formula, one proportion of surface to grate, was not insisted on, more than another; that a heavier boiler might work as economically as a lighter, and that the lighter boiler was only superior, in so far as it was desirable to combine compactness, lightness, and power, in locomotive engines. In order to correct errors, in the comprehension and application of the formula, it was deemed necessary to state that the formula might be constructed in two ways: first, to express the economical evaporative power (c') in cubic feet of water, per foot of grate, per hour; and second, to express the total economical evaporative power (c) in cubic feet of water, per hour; h and g respectively, being the total inside heating surface, and the area of grate, both in square feet.

The two constructions would then stand thus—

$$c' = \cdot 00222 \ldots \left(\frac{h}{g}\right)^2 \ldots (1)$$

$$c = \cdot 00222 \ldots \frac{h^2}{g} \ldots (2)$$

It was contended, that if, as was asserted, 20 per cent. of the coke, in the fire-box, was passed off as carbonic oxide, the evaporation, with ordinary boilers, could not exceed 7·2 lbs. of water, per pound of coke; and that in the new Express boiler, where the temperature in the smoke-box was found to be 1,100° to 1,200° Fahr., the evaporation could not exceed 5 lbs. of water per pound of coke, which was said to be at variance with the best ascertained facts. Though the evaporative performance of coke, in locomotive boilers, was liable to be vitiated

by priming, the results given in the Paper, were checked by the measurement of the steam passing through the cylinders, thus showing, by comparison with the water consumed from the tender, that there had been no material amount of priming.

A recent experiment was referred to, with an engine on the Caledonian Railway, in which the grate was reduced by brickwork from 10½ feet to 9 feet of surface; when it was found, that while an engine of the same class (with 10½ feet of grate surface) evaporated 122 feet of water per hour, at the rate of 6·8 lbs. per pound of coke, the engine, with the grate reduced to 9 feet, evaporated 132 feet per hour, at the rate of 8 lbs. per pound of coke; showing that the smaller grate raised more water per hour, and evaporated a greater quantity per pound of coke.

Throughout the discussion, the principal attack had been upon the formula and the reasoning in the Paper: but it was contended, that not one of the whole mass of submitted facts, nor the deductions from them, had been fairly impugned. The qualities of the engine had been constantly mixed up with those of the boiler; whereas the Paper treated of boilers, exclusively, and it was insisted, that the boiler and engine should be carefully distinguished, that the peculiar necessities and qualifications of each for efficiency, should be determined; and that then, the respective conditions for the efficient action of those elements, should be so adjusted as to produce the best joint result. Unless such a progressive course of investigation was followed, it was considered impossible to arrive at a final satisfactory conclusion.

It was explained, that as the Institution of Civil Engineers could, by its regulations, only consider accounts of "executed works," so its Council could not take the initiative in the proposed trials; the results of those trials, if submitted at a meeting, would doubtless undergo that candid consideration, and fair discussion, which all questions had hitherto received. Many of the results, already attained, were new and strange, and receiving them as facts, they induced careful reconsideration of previous impressions and accepted data, and from the attention thus directed to a most important subject great results might be anticipated. The profession was greatly indebted both to the Author of the original Paper, for the clear and definite views he had laid down, and to the designer of the new boiler and engine, for the statement of the results which had been produced.

They were both requested to continue their observations, and to again meet in the Institution, for the comparison and discussion of the results.

HISTORY OF MATHEMATICAL PERIODICALS.

We are indebted to Mr. T. T. Wilkinson, of Burnley, for the following article on *The Liverpool Apollonius*, in continuation of his excellent Series on Mathematical Periodicals, the last contribution to which appeared in vol. lvii., page 483, of the *Mechanics' Magazine*.

XXVIII.—"*The Liverpool Apollonius.*"

Origin.—The first Number of this periodical, which is entitled *The Liverpool Apollonius; or, the Geometrical and Philosophical Repository*, was issued in November, 1823. It was dedicated "To Thomas Leybourn, Esq., Professor of Mathematics, in the College, Sandhurst; the ardent, persevering, and able promoter of Mathematical Science, as a token of grateful recollection of thirty years' correspondence, by the Editor." The "advertisement" prefixed to this Number announces the work as "intended to furnish a page of record for the productions of genius; to supply the curious with useful and ennobling subjects of inquiry; to induce habits of *thinking;* to encourage the prosecution of mathematical and physical science; to familiarize *the study of geometry;* to cultivate an acquaintance with the most able writers; and thus, gradually and ultimately to institute a basis for investigating the probable structure and laws of the universe." The second, and final, Number was issued in December, 1824, and is dedicated by the Editor "To Robert Adrain, LL.D., Professor of Mathematics and Natural Philosophy, Columbia College, New York, as a public expression of esteem for his worth and talents." Both the parts of this valuable periodical are extremely scarce, from the circumstance of the very limited number printed, and the little pains the Editor took to make his work known to the public. I had no small difficulty in procuring No. 2, but was utterly unable to procure No. 1, until a copy was presented to me by my esteemed friend, the late Colin Campbell, Esq., of Liverpool.

Editor.—Mr. J. H. Swale, Master of Brunswick-place Academy, Liverpool

and author of "Geometrical Amusements," &c.

Contents.—The principal contents of each Number are—Original essays, extracts from works of eminence, sketches of mathematicians, original papers on geometry, astronomy, solutions of mathematical questions and new questions in the various departments of mathematics proposed for solution. Most of the extracts and essays are necessarily imperfect, owing to the short continuance of the publication, but sufficient, however, is given to furnish cause for regret that Mr. Swale did not favour the public with much more on such generally interesting subjects.

Amongst the papers, either partially or wholly printed, are "Memoirs of Apollonius and Archimedes," from Montucla; "Origin and Progress of Geometry," from Bossut; "On the Stability of Ships," from Vince; "View of Newton's System," from Maclauren; "Of Mathematical Axioms," from Dugald Stewart; "Essay on the Usefulness of Mathematical Learning," by Passman, from the *Quarterly Visitor;* "An Astronomical Correction," by R. Dickenson; "The Cambist," by the same; "A Series of Letters on the Newtonian System of Astronomy, &c." by B. Prescott, whose futile objections and crude remarks on astronomy and astronomers generally are said to have been one of the principal causes which led to the discontinuance of the *Apollonius.* The purely mathematical papers consist of "Some Properties of Tangential Circles, briefly demonstrated, with their application," to various problems on Tangencies; "Propositions on the Geometrical Maxima and Minima;"—in all *ten* propositions of great interest in geometrical inquiries; "Improved and generalized Solutions" to several interesting geometrical problems, including several properties of the *Horæ Geometricæ* in the *Diary*, not yet noticed elsewhere; "Diversified Solutions to the *same* problem," illustrating almost every variety of method in constructing some well-known problems in geometry; "On the Inscription of Polygons in a Circle, when each side of the Inscribed Figures passes through a given point;" a paper whose merits have been well described by the late Professor Davies in the third volume of the *Mathematician;* "On the description of Polygons in given Polygons, each side of the inscribed figure passing through a given point"—an appropriate and valuable appendage to the preceding essay; "A View of the Diophantine Analysis," by Dr. Robert Adrain; "On the Rectification and Quadrature of the Involute of a Regular Polygon." by Mr. John Whitley; "A New and Commodious Method of Solving Colonel Titus's Problem, and others of a similar kind," by Mr. Whitley, and forming one of the neatest and most effective methods of solving these celebrated equations; "On Maclaurin's and Taylor's Theorems," by Mr. Samuel Jones. The whole of the geometrical papers are by Mr. Swale himself, and are everywhere characterised by his usual elegance, originality, and fertility of invention. All of them possess a peculiar value to the student of pure geometry, and the historical interest attaching to many of the problems discussed will always render the *Apollonius* one of our most esteemed mathematical periodicals.

New Mode of Generating Steam.—Mr. S. Cable, of St. Louis, has taken out a patent for a new mode of generating steam, by which he proposes to dispense with boilers altogether. His plan is to employ a metallic network, similar to Ericsson's, upon which, when in a properly heated state, jets of water will be thrown, and being immediately converted into steam, will be conveyed to the steam-chest, where it will be employed in the usual manner. The advantages claimed are economy in fuel and safety from explosion. How he proposes to restore the heat we do not know.

Progress of the Screw Navy.—The *Royal Albert*, 131, screw steamship, at Woolwich, is progressing rapidly towards being ready for launching, upwards of 200 men and boys being constantly employed upon her on task and jobwork, and they are so anxious to make full time that many of them do not go home to dinner. The framework of the stern is now all put up the entire length of the alterations, and the workmen are making ready the piles on which will be placed the ways over which she is to pass when launched. The *James Watt*, of 91 guns, will shortly be ready for launching at Pembroke, and when afloat will immediately be rigged and made ready for commission.

Heavy gangs of men have for some time past been actively employed in pushing on the work of completion. Her armament will be a formidable one, and, it is said, will consist of 28 8-inch guns, and 62 32-pounders of 56 cwt. and 9 feet 6 inches in length. She will also mount 1 pivot-gun, which will be a 68-pounder, 10 feet in length.

QUEEN'S COLLEGE, BIRMINGHAM.

The impetus given to the study of the extensive range of subjects which constitute the education of the civil engineer, by the establishment of the Queen's College at Birmingham, is rapidly rendering that great central metropolis of our manufactures another focus of scientific learning, in which every true friend of human progress must sincerely rejoice. On a recent occasion we referred, in terms of hearty commendation, to the efforts which had been productive of so excellent a result, and we now feel an equal pleasure in contemplating the activity and discretion that pervade all the arrangements for carrying into successful effect the intentions of the numerous and generous patrons of practical science who have contributed to its prosperity. As will be seen by an advertisement in this Number, the department in connection with "*arts, manufactures, and commerce*" is to be opened in May. The appeal from the College to the noble patrons and friends of education, to enable the Council to purchase expensive philosophical apparatus, models, &c., and to fit up the chemical laboratory and engineering workshop, has been generously responded to by the Duke of Sutherland, the Marquis of Lansdowne, the Earls of Dartmouth, Clarendon, Granville; the Lords Foley, Calthorpe, Leigh, Redesdale, and Lifford; General Vyse, Mark Phillips, Esq, Messrs. Piercy, Dawes, Bagnall, Barrows, and Hall, and other leading Staffordshire iron masters; by Messrs. Welch, Armfield, Upfill, and other influential merchants of the town. Considering the present condition of commercial enterprise, the unrestricted competition to which the trade and manufactures of the country must inevitably henceforth be exposed, in connection with the fact, that systematic education in arts and manufactures is established in some continental states, cogent argument is supplied that this department, under the powers granted by the Crown to the College, should be energetically carried out, and the recent alarming and numerous accidents in ships, mines, manufactories, and railways, must be allowed to add still further importance to this branch of education. The Council are also sanguine in their expectations that they shall be able to form, by kind donations from the public at large, specimens of mining and mineral products, of chemical and pharmaceutical preparations, of vegetable and animal substances used in manufactures, of civil, engineering, architectural, and building contrivances, of manufacturing machines and tools, of philosophical apparatus, of models and plastic art, &c.; a great "central museum," accessible to the artizan under certain regulations, and subservient to the general purposes of literature and science, and especially to the courses of education in the College in the engineering, architectural, and chemical branches. It must be admitted, that no town in the kingdom offers such practical advantages as Birmingham.

THE THIRTY-TON CRANE AT DUNDEE HARBOUR.

By James Leslie, Esq., Edinburgh, C.E.

The following is the description of the crane constructed of cast and wrought iron, calculated to lift thirty tons, erected on the quay of Earl Grey's Dock, Dundee, in 1839. The crane is placed on a stone platform, raised 6 feet above the level of the quay. The part which turns round works in a cast-iron water-tight cylinder, 27 feet deep (reaching down to nearly the bottom of the dock), 5 ft. 3 in. diameter, 1¼ inch thick, but 6 ft. 4 in. diameter at the top, and turned inside to form a collar for the friction-rollers. The post consists of a cast-iron front or straining-piece, and of six wrought-iron back or tension-rods, each 3 by 2¼ inches, and two side-stays. The ring containing the rollers for the turning motion, which, of course, makes only half a revolution for a whole revolution of the crane, is supported on vertical sheaves, and the rollers, when at the back, may be easily taken out and cleaned.

The masonry is bound down by sixteen 2½-inch round bolts, and has also four diagonal bolts of the same size. The radius is 35 feet to the centre of the jib-sheave, giving a sweep of 35 feet, or 28 feet beyond the face of the wall when using a double purchase, and one foot more with a single purchase. The height to the centre of the jib-sheave above the platform is 34 feet. The jib is of oak, 2 feet diameter at the middle, and 21 inches at the ends. The

jib-stays are 2⅛ inches diameter, and the chain 1¼ inch diameter. When using the double purchase, the chain is hooked up to an eye under the jib, and the weight suspended from a sheave in the bight.

The following are the weights of the various parts:

	cwt.	qr.	lb.	cwt.	qr.	lb.
Fixed cast-iron—						
Footstep	47	3	15			
Cylinder	303	1	10			
Ring	30	3	25			
Washers	5	0	0			
Total fixed cast-iron	387	0	22	387	0	22
Moveable cast-iron—						
Lower piece of post...	181	0	14			
Top ditto.........	147	0	24			
Cheeks	68	0	14			
Bottom socket for jib..	20	1	19			
Top ditto	33	1	18			
Barrel	13	1	11			
Cylinder cover	16	0	13			
Sundry castings.........	77	3	12			
Tot. moveable ct.-iron	557	2	13	557	2	13
Malleable iron in masonry and cylinder...	68	0	9			
Ditto in moveable part of crane	148	1	10			
Chain	19	2	0			
Total malleable iron	235	3	19	235	3	19
Brass				2	2	13
Total weight of crane				1,183	1	11

The crane turns remarkably easily round; in fact, before the turning gear was put up, it used to blow round with the wind. Eight men can easily lift 30 tons, and, by the application of the horizontal gearing, one man can move it round. The crane is only warranted to carry 30 tons, but has been tested with 32, and there is little doubt that it would easily carry 40 tons. It was constructed at the Tay Foundry, Dundee, and has worked most satisfactorily. The cost for ironwork and machinery was about 1,200*l.*, which, however, was probably too low a price. The masonry cost about 800*l.*, and the total expenditure was 2,030*l.*—*Civil Engineer and Architects' Journal.*

Ship-Building on the Wear.—During the past week, four very fine vessels have been launched at that place. One of these vessels, a clipper, the *Kangaroo*, built by Mr. Pyle, of the North Sands, is, in nautical parlance, "to lick everything afloat." She is for the Australian trade. It is stated that she has been brought to a sharper point than any other merchantman hitherto built in Sunderland. She is built on the wave principle, and, to some extent, her model is original. As her speed and capabilities have to be tested, the public will hear more of her. The other three vessels are—an East Indiaman, an Australian trader, and a vessel for the Mediterranean trade. The Court of Arbitration for the settlement of disputes between the master-shipbuilders and their workmen at this port is proceeding in a most satisfactory manner and is likely to do much good.

LAUNCH OF THE "ELFIN."

On Saturday afternoon a fine paddle steam-vessel, constructed by Mr. John Thompson, of Rotherhithe, for the service of the old Woolwich Steam-Packet Company, was launched from that gentleman's yard adjoining the Commercial Pier. The principle upon which she is built is one which has proved extremely successful in practice, the *Banshee*, some of the larger Brighton packets, and a few of the Woolwich diamond boats, being illustrations of its efficiency. It has been termed the "diagonal principle," and Mr. Thompson, who has built several vessels for the naval and civil services, the above among the rest, besides the *Primero* and the *Segundo*, for Cuba, has devoted many years towards its introduction into extensive use. When noticing the launches of the two last-named vessels respectively, on the 11th of September and the 16th of October, we gave an account of this system of construction, and pointed out the peculiar advantages which belong to it in point of strength and rigidity, and also as favouring the safety of the vessel. These are qualities which the vessel launched on Saturday is considered to enjoy in an eminent degree, and she has given great satisfaction to her owners. Her principal dimensions are as follow;—Length between the perpendiculars, 150 feet (which is 15 feet longer than the *Nymph*, the longest and swiftest in their service); width of beam, 16 feet; height of saloon, 7 feet; and tonnage, 168. She is calculated to carry 500 passengers, according to the present state of the regulations imposed by the Board of Trade, which for some time past has been gradually lowering the number they license, but could easily convey as many as 700.

All the preliminary steps were completed by a quarter to three o'clock, at which time it was nearly high water, and the word was given to "knock away the dog-shores." The vessel glided slowly and majestically down the incline, receiving from Miss Collins, the daughter of one of the Directors, the name of "Elfin" at the instant of the commencement of her motion. She dashed boldly into the water, amidst the acclamations of a large assemblage of

spectators, and immediately assumed a trim which exhibited the perfect accuracy of her figure and construction. Her draught of water was 2 feet 1 inch by the head, and 2 feet 8 inches by the stern, which will be increased to a nearly uniform draught of 3 feet 8 inches when she is supplied with her engines, boilers, and equipments. Her graceful proportions when afloat struck the eye of the critical with admiration. She has been built from the lines of Mr. O. W. Lang of Chatham, a gentleman who has contributed so many fine examples to our models of naval architecture. The feature which most distinguishes her form is that of her having a more hollow bow near the load-water line, or being rather more "razor-faced." Her run, also, is rather finer than usual in vessels of this class, both of which circumstances are highly favourable to her performance.

The *Elfin* was now brought alongside of the *Nymph*, which was lying at the pier, under the command of Captain Wheeler, who enjoys the honourable distinction of commodore in the company's service, ready to take her down to Woolwich, to receive her engines. A gang of men, under the direction of Mr. Ling, the superintendent, and Captain Wheeler, soon removed the portions of the cradles which the launch had brought away, and being made fast to the larboard side of the *Nymph*, by head and stern ropes, the latter proceeded with her promising charge to the wharf of the company's works, Globe-lane, Woolwich. Her engines, which are in a state of great forwardness, are on the oscillating principle, and will be nominally of the collective power of 40 horses, though capable of working up to three times that amount. In passing, we may observe that the works of the company have now been established some three or four years, and that all alterations and repairs needed in their boats are performed here, and keep them in a state of constant activity.

The *Elfin* is the eleventh boat which the Company now possesses, and will replace the *Flora*, which was some time ago condemned, as unfit for further service.

TRIAL TRIP OF THE "DUKE OF WELLINGTON."

On Monday last, about noon, the leviathan screw three-decker *Duke of Wellington*, 131, Captain H. B. Martin, C.B., was taken out of Portsmouth Harbour for her first trial in steaming. We remember no event that created at that port more general and intense interest. The walls of the garrison were thronged with spectators of all ranks, and the line of beach extending from Hollingsworth's Rooms to Southsea Castle seemed literally "alive" with a multitude of eager spectators, on foot and on horseback, to the number of many thousands.

The *Duke of Wellington* made six runs along the measured mile at Stokes' Bay, which realized the following results:

Runs	Revolutions.	Time.	Knots per Hour.	Average of Knots per hour.
		m. s.		
First......	29	5 25	10·495	10·022
Second...	30	6 15	9·057	
Third	29½	5 28	10 975	10·187
Fourth...	31	6 23	9·399	
Fifth......	29	5 23	11·145	10·100
Sixth	29	6 37	9·068	

These results were deemed eminently satisfactory to all on board. The ship anchored at Spithead for the night.

THE TRADES OF BIRMINGHAM.

The fall in the price of iron, although small, has afforded great satisfaction, and been already productive of benefit. In the neighbourhood of Willenhall and Wolverhampton large orders for locks, which have been held back the last six weeks, are now in course of execution. Many of them are for the American market, but the greater portion, which are of a superior quality, are for home consumption.

The nail trade, which when brisk affords employment to such an immense number of persons, has also received an additional impetus from the reduction in the price of iron, and many other branches of industry have likewise been benefited. According to a circular issued by the nail-masters of the district, there has been another fall in the price of cut nails, which may in some degree, also, be the result of the rivalry of the Leeds makers.

Notwithstanding the unfavourable accounts from Australia, manufacturers are as busy as ever in supplying that country with articles of local make. There appears to be no limit to the trade with that distant colony. Large shipments are continually taking place, and the demand for guns and pistols is really greater than our makers, with the present Government contracts on hand, can promptly supply. Prices are consequently greatly enhanced, and it has become a favour to have orders executed. The edge-tool and hollow-ware business is similarly active, not only for foreign, but for distant markets. The glass trade is de-

scribed as remarkably brisk, and ornamental brass-foundry as exceedingly prosperous. The almost only Birmingham manufacture which may be said to be in a comparatively drooping state is the brass button trade. This once famous trade, when brass buttons formed a conspicuous ornament in an English gentleman's dress, is now chiefly employed for foreign countries, to which considerable quantities continue to be exported. South America and the West Indian colonies are among the best customers for this famed Birmingham article. There are at present large orders on hand for those countries. The pearl-button trade is suffering in some degree from the advance which, owing to the operations of speculators, has taken place in the price of shell.

There are few, if any goods now being sent out on speculation from this district, and none but *bonâ fide* orders through good London, Liverpool, or other houses are accepted. The American summer trade has commenced favourably. A considerable number of orders for fancy jewellery have been received, and are giving profitable employment to good hands. The match-making trade is very brisk; and hands are required in the following trades:—Machinists and fitters, coach-smiths, cabinet-makers and carvers, dressing and fancy leather-case makers, riddle-makers, ornamental brass-work dressers, jewellers, kitchen-range fitters, awl-blade and clock-movement forgers, horse-nail makers, sheet iron rollers, furnace-men, japanners, &c. The general trade of the town is therefore in a sound state.

The export returns, issued yesterday, are confirmatory of the above favourable report as to the condition of trade. It appears the total value of the transactions for the month ending 5th of March, exceeds that of the corresponding month last year by nearly one million pounds; the exports in the one case being worth 5,353,552*l.*, in the other 6,272,649*l.*; the nett increasing being 919,097*l.* Towards this very gratifying result the manufacturers of this town and district have largely contributed, as the following figures will show. In hardware and cutlery there has been an increase of 26,852*l.*; machinery, 26,000*l.*; iron, 254,912*l.*; copper, 15,720*l.*; brass, 228*l.*; tin plates, (notwithstanding the exceeding high price), 56,638*l.*; glass, 2,835*l.*

THE IRON TRADE.

The demand for iron continues active, the order-books are still well filled, and the general opinion is that the prices of last week will be maintained at the quarterly meetings to be held next week. Being the last week of the iron-masters' quarter, as is usual at such a period, and more especially when some degree of uncertainty is felt with regard to future prices, some buyers are reluctant to purchase more of the raw material than is immediately required for manufacturing purposes; but still, taking all circumstances into consideration, the iron trade is, as far as plates, sheets, and rails are concerned, deemed brisk, and from all accounts is likely to continue so. The present reduction of 20s. per ton on manufactured iron, we are told, upon competent authority, has displeased some of the great iron-masters, inasmuch as they cannot get a corresponding reduction on coal and stone, and are obliged to pay the same price for material as they paid before the reduction took place. In allusion to this subject, a writer in the *Birmingham Mercury* says:—"If, however, we take into consideration the present price of pigs and fuel, a good profit will be realized on bar-iron at 10*l.* If we call pigs 4*l.* 10s., and the manufacturing process 3*l.* 10s., including capital and all contingent expenses, it will leave a profit of 2*l.* per ton. When pig iron was 2*l.* 15s. per ton, and bars 5*l.* 10s., there was then a good profit made by many of the manufacturers of iron, as was clearly seen by the extension of their works and other unmistakeable circumstances."

America.—By the Royal Mail-steamer *Canada*, which arrived at Liverpool on Sunday, with advices from New York to the 29th, and from Boston to the 30th of March, we learn that the iron market was unsettled. Scotch pig offered on the spot at 38 dollars, and to arrive at 32 dollars to 36 dollars per ton. English bar quoted at 65 dollars for common, and 85 dollars for refined.

MAIN'S PRINTING MACHINE.

The *Edinburgh Courant* gives the following account of Mr. Main's new printing machine:—We were, a few days ago, invited to witness a new printing machine, patented by the inventor, Mr. Thomas Main, of London, formerly of Glasgow, and fitted up by him in the premises of Messrs. Thomas Nelson and Sons here. The machine is of remarkably simple construction, is worked at a small cost of labour, and is capable of great speed. Instead of a cylinder rotating on its axis, which is the principle of almost all printing machines, it has a cylinder of small diameter moving along a fixed table, or plane, on two-thirds of its surface, and immediately retracing its course. Its motions are regulated below by a wheel moving backwards

and forwards upon a rack; and, in the return movement, it is elevated about a third of an inch from the types, to avoid a second pressure. The cylinder is 18 inches in diameter, and about 36 or 38 inches in length. The table for the form is 46 inches by 38. The sheet is placed upon the delivering-table, which is only a few inches higher than the level of the form, and is taken up by clasps in the hollow part of the cylinder, and wound round it as it moves along, receiving at the same moment the impression of the types, while, in the return movement, it is taken off upon another table. The ink is supplied very nearly in the usual manner. The whole labour required in working the machine is two boys, or one man and a boy; the one to "feed," and the other to "to take out." The machine is capable of throwing off above 1,000 impressions an hour, which, for a single cylinder, is an extraordinary speed. Altogether, the machine displays great ingenuity: it is admirable for its simplicity, and valuable for its dispatch.

BRILLIANT SOLAR PHENOMENON.

On the afternoon of Sunday the following solar phenomenon was observed by M. E. J. Lowe, at Highfield-house, and described by him in a letter to the *Times;*

At 3h. 40m. a solar halo of 22 degs. radius became visible. At 3h. 42m. a mock sun formed on the halo on the south side and on the sun's horizontal level; at 4h. 45m. the phenomenon became very imposing, the halo brighter, and at its apex a portion of an inverted arc, visible, having a mock sun at the point of contact with the halo of 22 degs. radius; mock suns on either side the true sun at the same altitude, and distant 22 degs. from that luminary; these were pale and confused. Two prismatic portions of a circle of 45 degs. radius, which had the sun for its centre, were also now formed. Above the true sun, at a distance of 45 degs., was an inverted arc of a circle of probably 50 deg. diameter, exceedingly brilliant, surpassing the rainbow in brilliancy of colour—width, 1 deg.; length of arc, 40 degs. The whole circles had the red colour nearest to the sun. At 4h. 50m. the phenomenon had vanished with the exception of the halo of 22 degs. The sky was scattered over with cirri and cumuli, which rendered the phenomenon invisible after 5h. 30m.

The Collodion Photographic Process.—The following process, it is understood, has been adopted in France for keeping the collodion plates sensitive for many hours. Two pieces of plate glass, of equal size, are taken, and on one the collodion film is spread in the usual way; it is then dipped in the nitrate of silver bath, and when the streakiness has disappeared it is lifted vertically from the bath, leaving the lower edge just immersed in the fluid. The second piece of glass is then applied to the collodion film, beginning at the lower edge. A thin stratum of the solution, by capilliary attraction, becomes enclosed between the two glasses, which are then placed in the slider; and it is said that thus prepared, they may be kept sensitive a whole day, before exposing them to the action of the camera. On the operator's return home, the glasses are easily separated by the introduction, at one corner, of a thin ivory or bone paper-knife, without any injury to the collodion film, and the image is then developed in the usual way.—*Journal of the Society of Arts.*

MR. WOOLLGAR AND THE SLIDE RULE.

To the Editor of the Mechanics' Magazine.

Sir,—Referring to No. 849 of the *Mechanics' Magazine,* in which there is an article upon the sliding rule, by J. W. Woollgar, he says, respecting the Line "X:"—"I have only to add, that no traces of the theory now expounded have been found in any essay on the slide rule, nor any practical application of it." To this I beg to demur, on account of the silent dead;—and because Dr. Bateman, in the last edition of the *Manual,* ascribes to Mr. Woollgar "the invention of this ingenious line." The latter knows that this is not so, as I have had a correspondence with him upon the subject, the theory of which is given in "Symon's Practical Gauger," at pages 205 and 206, published in 1826. It never was graduated on the slide rule, until through me, by Dring and Fage, of Tooley-street, London. From the book to which I have referred, the special gauge points were extracted and graduated upon this rule, in precisely the same order as they are found at page 206. The *line* in question, therefore, was not invented by Mr. Woollgar, nor by his instructions graduated upon the rules. It is said to have been invented by Mr. John Lowery,—at one time an excise-officer.

I am, Sir, &c.,

J. Whitford.

Ware, April 7, 1853.

Heather's Statics, Dynamics, Hydrostatics, and Hydronynamics Second Notice. John Weale.

In reviewing the above work under the title of "A Course of Mathematics," &c., we inadvertently omitted to explain that it formed Volume III. and Part I. of a Course prepared for the Royal Military Academy, Woolwich, by various learned men. Having already spoken in terms of high commendation of Mr. Heather's treatise on the mechanical and hydrostatical portion of the series, the number and originality of its examples, and their susceptibility of immediate application in practice, we have merely adverted to this point with the view of removing any misapprehensions which might have been formed as to the extent of the author's labours. We readily avail ourselves of this opportunity, however, to say a few words respecting this course of treatises on the mathematical sciences, so valuable to the student from their having been written with a thorough knowledge and appreciation of the difficulties which he has to deal with. Volume III., Part II., is a treatise on Geodesy and Nautical Astronomy by Captain Yolland, R.E., which as a book of instruction, for persons engaged on a trigometrical survey, will be found very valuable. The first two volumes contain nothing of novelty or calling for particular remark, with the exception of the geometry by the late T. S. Davies. These subjects respectively, as in the case of Mr. Heather's portion of the Course, are elegantly and clearly developed, and the investigations, and the examples under them, are illustrated with a profusion of well-executed engravings.

Hydraulic Tables, Coefficients, and Formulæ. By John Neville, C.E., M.R.I.A., County Surveyor of Louth, and of the County of the Town of Drogheda. John Weale.

This is a contribution to the science of hydraulic engineering which must prove of great value in the original design and subsequent conduct of works depending for their efficiency on the discharge of water from orifices, notches, weirs, pipes, and rivers. Though professing for the most part to contain a rich store of hydraulic formulæ, a collection of carefully observed results, and a great number of tables of coefficients and subsidiary quantities for facilitating computation, the author has added much of the fruits of his own experimental and analytical labours to those of Du Buat, D'Aubuisson, Provis, Eytelwein, Leslie, Prony, Poncelet, Lesbros, Young, and other well-known men, who have developed the subject in its most practical form. In the reduction to computation of such phenomena as the motion of fluids, which involve sources of error so subtle as to escape the finest network of the most profound mathematics, theory can hope to do little more, in the great majority of cases, than suggest the probable form of the result to be expected from a given set of circumstances. Experiment must be resorted to on a large scale, and results must be observed in great number and variety, and with extreme precision. On this account most of the analytical expressions here concerned are to a great extent empirical, and if they indicate results approximating with tolerable closeness to those of experiments, it is all that we are able at present to expect. In offering to the engineering community the results of his own experience, and their application in practice through the instrumentality of formulæ, the author appears to have been particularly careful with regard to the experiments themselves, and the exhibition of their results in an analytical shape; while the numerous situations occurring in practice which he has come forward to assist, give a great value to his labours, and should ensure them a welcome reception. For the rest he has diligently collected the calculations and observations of the most celebrated authorities, English and foreign, and converted the quantities assigned by the latter into their equivalent English values, we believe, for the first time. The collection of tables at the end of the work is exceedingly copious, and with the exception of the first, which contains the wellknown coefficients of Poncelet and Lesbros, newly arranged, and reduced to English inches, are all original. The coefficients given in the small tables throughout the work, have been computed by the author from the original experiments. Among the objects to which the tables at the end of the work refer, are several which will be recognised as of great utility. The reciprocal finding of velocities and the altitudes due to them, the velocity of approach to weirs and the depression on the crest, coefficients of discharge for different ratios of the channel to the orifice, the discharge over weirs or notches of one foot in length in cubic feet per minute, finding the mean from the maximum velocity at the surface in mill-races and rivers with uniform channels, and *vice versâ*, the mean veloci-

ties of water flowing in pipes, streams, and rivers, and the depths on weirs of different lengths, are among the number. Mr. Neville has developed the general subject in a very elaborate manner, always giving authority where authority exists, and criticising it with reference to practical application. He has collected many of his materials from a very extensive surface of mathematical and engineering literature, and has been careful to point out the comparison of results derived from every empirical formula with those of experiment, supplying very frequently omissions and cautions, and correcting misprints of formulæ which have arisen rather frequently in the process of copying from one work into another. Upon the whole, it is not too much to say that the work is eminently adapted to the wants of engineers of the present day, engaged in marine, river, and water-course works generally, and that the author has exhausted the entire circle of hydraulic experiment and analysis in his praiseworthy endeavour to collect, examine, and exhibit in an accurate and practical form, the huge and scattered mass of knowledge which the cultivators of this science, throughout Europe, have accumulated by patient and long continued research.

An Introduction to Algebra, and to the Solution of Numerical Equations. Intended for the use of Schools and Private Students. By J. R. Young, late Professor of Mathematics in the Royal Academical Institution, Belfast. Charles Mozley.

The well-known excellence of the mathematical works of this author, will ensure for this volume a large share of popularity among those who are only advanced a little way upon the sublime study of analysis. Though it may seem to have been almost a supererogatory labour to write a work on Algebra professedly of an elementary character, at a time when our increased educational appliances have done so much to assist the acquisition of this subject, those who have had an experience of the difficulties of conveying a substantial knowledge of the great principles of operation, will appreciate the object which the learned writer of the book before us has kept in view. A student having it in his possession, and directing his studies according to its instructions, will find many of the obstacles removed which have been found to impede the progress of the tyro, and at the same time feel himself encouraged to go on. In this respect the "Introduction to Algebra" differs very much from class-books of the older school, which consisted very much of cut-and-dried rules of proceeding, accompanied with fundamental investigations—sometimes succinct and satisfactory, sometimes the reverse,—and with examples for practice. Here, on the contrary, besides examples in abundance—some of them remarkable for their originality,—the author bestows considerable pains in pointing out the precise effect of particular processes, contrasting the principle of them with that which governs others, and always showing how the labour of operose calculations may be reduced. The relation of the several processes to each other we regard as a most important point, and no author is better fitted for the task than the author of this "Introduction." His efforts have been most successful in this respect, and especially recommend the work as a text-book for the young. It embraces the usual subdivisions of the subject, and has besides a few points of originality and peculiar excellence. First of these, we may notice the exposition of the methods for the reduction to a quadratic solution of particular cases of equations of the third and fourth degrees; a method which will, in many cases, effect a solution, or facilitate the operation of finding the approximate value of the root. A very substantial explanation and illustration of Horner's method is given in a form extremely convenient for application by the young algebraist, and in connection with it a new process for discovering the leading figure of a root, a necessary operation preliminary to applying that important method. This method is, at the same time, of great use in facilitating the practice of Budan's theorem. We may observe, in conclusion, and we do so with pleasure, that the author refers his reader, in commendatory terms, to the mathematical contributions of Mr. James Cockle, in the *Mechanics' Magazine.* The mathematical reader may take this circumstance, and other references to Mr. G. B. Jerrard and other recent writers, as an indication that the author has had his eyes abroad to impart into his work whatever was good in the scattered scientific literature of the day, and he will find that much valuable matter has been in this manner placed before him, which it might be difficult otherwise to obtain.

Ship-building on the Clyde.—There are at present 100 vessels in course of construction on the Clyde, and of these only 6 are timber-built, all the rest being built of

iron. It is also notable that these iron vessels consist both of steam and sailing vessels, though the former class preponderates. The aggregate tonnage of the ships now in course of construction on the Clyde amounts to upwards of 60,000 tons. The engines of the steam part of this great fleet have an aggregate of more than 14,000 horse power. The probable value of the whole, though the estimate is necessarily inexact, cannot be much short of 2,000,000*l.* sterling! Yet, in a few months, this enormous amount of shipping will be off the stocks, and its place supplied by a new production, equally valuable. The number of workmen employed in building the vessels and making the machinery is about 15,000. The number of hands employed in raising the raw materials from the basin of the Clyde, within a circuit of 20 or 30 miles, for these and similar great works, is still more immense. Another most gratifying feature of the ship-building trade of the Clyde is, that the employers in nearly all the establishments were working men themselves within the last thirty years. Most of them had attained the period of middle life before they turned their attention to iron boat-building at all. The men are not only the architects of their own fortunes, but the creators of a new branch of industry.—*North British Mail.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING APRIL 14, 1853.

William Hunt, of Stoke Prior, Worcester, manufacturing chemist. *For certain improved modes or means of producing or obtaining ammoniacal salts.* Patent dated September 30, 1852.

The object of this invention is to obtain sulphate of ammonia from the ammoniacal liquors of gas-works, and this is effected by causing the liquors to traverse a column or condenser filled with pebbles and coke, and to be brought in contact with sulphurous acid gas, which may be obtained by calcining pyrites of any description, so as to drive off the sulphur therefrom. The sulphurous gas may be introduced at the top of the column, and descend with the falling liquid, or at the bottom, and be drawn upwards by the draught of a high chimney; in either case care being taken to cool the gas previous to its coming in contact with the ammoniacal liquor. The result of the action of the gas is to convert the ammonia present to a sulphite of that base from which the sulphite may be obtained by subsequent evaporation and exposure to air, by which oxydation will be induced and the chemical change effected.

Instead of using sulphurous acid gas, the spare gas from vitriol chambers, which consists of a mixture of sulphuric, sulphurous, and nitric acid, may be advantageously employed.

The claims are for—

1. The apparatus described, or any modification thereof, wherein the ammoniacal liquors are treated with sulphurous acid; and

2. The application of the spare gas from vitriol chambers in the production of salts of ammonia.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn. *For improvements in the manufacture of boots and shoes, parts of which said improvements are applicable also to the manufacture of various other articles of dress.* (A communication.) Patent dated September 30, 1852.

This invention comprehends—

1. An improved mode of manufacturing boots and shoes by cutting the entire upper-leather from a single piece, which is either riveted or sewn to the sole, and secured at the seams by riveting, stitching, or cementing.

2. An improved cement for uniting to each other the parts of boots and shoes, and for use in manufacturing other articles of dress where cement is employed. This cement is composed of 64 parts by weight per cent. of gutta percha, 16 parts of India-rubber, 8 parts of pitch, 4 parts of shellac, and 8 parts of oil. The ingredients are mixed and melted together, the India-rubber having been previously dissolved, and are kept in a boiling state for two or three days, after which the cement is fit for use, but should be applied in a warm state.

3. An improved mode or modes of riveting the parts of boots and shoes together. The rivets used are of two kinds; first, a simple eyelet, or short flanched tube, which is passed through holes in the materials to be joined, and then flattened down, after which the vacant space at the centre is filled in with solder; and, second, a somewhat similar tube, the centre of which is occupied by a stud or screw instead of solder. When thick pieces of leather are to be joined for making soles or driving bands, one of the ends is split, and the other shaved down and inserted in the split end, and the whole then riveted through either with or without the use of cement.

No claims.

Charles Billson, of Leicester, manufacturer, and Caleb Bedells, of Leicester, aforesaid, manufacturer. *For improvements in the manufacture of articles of dress, where looped fabrics are used, and in preparing*

looped fabrics for making articles of dress and parts of garments. Patent dated September 30, 1852.

The *first* of these improvements consists in making up jackets and other similar articles of dress composed of looped fabrics, with waistcoats or fronts of non-elastic material, the jackets being made so as to open in front and expose the waistcoat when the collars are folded back.

The *second* improvement consists in applying sheets of India-rubber between two surfaces of looped fabrics and cementing the whole together, so as to form an elastic material, the faces of which shall be composed of the looped fabrics.

The *third* improvement consists in adopting the use of looped fabrics in the manufacture of such piled fabrics as are produced by cementing the pile thereto by its ends.

Claims.—1. The combining non-elastic and elastic fabrics in making up jackets and dresses.

2. Combining vulcanized India-rubber with looped fabrics.

3. The mode of making piled fabrics.

WILLIAM HODGSON, of Skircoat, York, engineer. *For improvements in the manufacture of woven, textile, and looped fabrics, and in the machinery employed therein.* Patent dated September 30, 1852.

Claims.—1. The manufacture of woven, textile, and looped fabrics direct from a sliver, without the intervention of spinning-machinery.

2. Certain arrangements and combinations of machinery for effecting this object.

HENRY GARDENER GUION JUDE, of Lower Copenhagen-street, Barnsbury-road, Islington. *For improvements in the manufacture of type.* (A communication.) Patent dated September 30, 1852.

The *first* branch of these improvements is based on a former patent granted to M. P. P. de St. Charles, July 1st, 1845, for the manufacture of type from strips of metal wire by compression in suitable matrices. It has been found that as the quantity of metal cut off at each stroke of the machine when working according to the instructions contained in the specification of the above patent, is generally in excess of the exact amount required to produce a single type; and the quality of type thus manufactured is affected, owing to the unequal degrees of pressure to which the metal is in different cases subjected. To obviate this difficulty, it is now proposed to form the strips from which the blanks are cut, or the blanks themselves, with longitudinal grooves at the sides, so that although the metal will occupy the full diagonal space of the moulds, it will enable the excess to be compressed so as to fill the mould, and thus produce a perfect type.

The *second* branch of the improvements consists in forming the faces or printing portions of type, vignettes, and other devices in relief, by compression from copper or other hard metal, and then casting bodies of an inferior or softer metal thereon; or these faces may be affixed to bodies of wood or other materials.

Claims.—1. The formation of grooves or indentations in the wires or blanks from which types are made by compression.

2. The formation or manufacture of type faces, such as letters, vignettes, or other devices in relief for printing, by compression in suitable matrices, which faces are attached to bodies, and otherwise finished or described.

CHRISTOPHER NICKELS, of York-road, Lambeth, manufacturer, and BENJAMIN BURROWS, of Leicester. *For improvements in weaving.* Patent dated September 30, 1852.

This invention consists, first, of a method of arranging the parts of looms so that two sheds shall be simultaneously opened in the warp, and two shuttles thrown therein from opposite sides of the loom, so as to cross each other; and second, in arranging the warps when a stationary or dead warp is used, so that the sheds shall be opened alternately above and below the dead warp, and two shuttles used to throw in the weft into the sheds thus opened.

Claim.—The combination for weaving fabrics with two shuttles thrown simultaneously across in two sheds opened in the warp to receive the same.

SOLOMON ANDREWS, of Perth Amboy, in the United States of America, engineer. *For improvements in machinery for cutting, punching, stamping, forging, and bending metals and other substances, which are also applicable to the driving of piles, and other similar purposes, and to crushing and pulverizing ores and other hard substances.* Patent dated October 7, 1852.

For description of Mr. Andrews's improved machinery, see the first article of the present Number.

PIERRE ARMAND LECOMTE DE FONTAINEMOREAU, of South-street, Finsbury. *For certain improvements in washing, bleaching, and dyeing flax and hemp, and in mixing them with other textile substances.* (A communication.) Patent dated October 7, 1852.

The washing, bleaching, and dyeing operations are to be performed by any of the usual processes on skeins of flax and hemp, after they have passed through the bobbin and fly-frame, and before proceeding to the final operation of spinning them into threads.

The mixing operations are of two kinds. The first consists in combining coloured and uncoloured tufts of flax and hemp, and then spinning them into threads; the second consists in mixing spun threads of any material with flax and hemp on the mule, the arrangements of the rollers in this case requiring to be altered so as not to draw the spun threads during the operation.

Claims.—1. This mode of washing, bleaching, and dyeing flax and hemp after having passed through the bobbins and fly-frame.

2. The mode of mixing in a thread coloured tufts of flax and hemp.

3. The arrangement of the rollers in the mule for spinning threads of silk, cotton, wool, or any fibrous substance with tufts of flax or hemp.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agents. *For improvements in the manufacture of sugar, and in the machinery and apparatus employed therein.* (A communication.) Patent dated October 7, 1852.

The improvements claimed under this patent comprehend,

1. A mode or modes of constructing sugar presses for expressing saccharine juices from the cane, beetroot, or other substance containing them.

2. An apparatus for generating and impregnating with carbonic acid gas saccharine solutions for the purpose of freeing them of any excess of alkali they may contain, and at the same time of decoloring them.

3. Certain means of, and apparatus for separating fluid from granulated sugar, and for purifying and removing the colouring matter therefrom, and for cleansing sugar.

JOHN REED RANDELL, of Newlyn East, Cornwall, farmer. *For improvements in cutting and reaping machines.* Patent dated October 7, 1852.

Claims.—1. The employment of wheel-gearing for giving motion to the cutters or knives of reaping machines.

2. A mode of constructing the guard teeth or fingers, in such manner that they shall not only clear, but also sharpen the cutters.

3. A mode of forming the cutters open, or with a portion removed from their centre, so that they may readily clear themselves when cutting.

4. A peculiar arrangement of open guard teeth or fingers.

5. A means of adjusting the cutting bar with its cutters or knives.

6. The employment of a board, or its equivalent, for clearing the track of the machine.

PROVISIONAL PROTECTIONS.

Dated March 7, 1853.

575. Augustino Carosio. A hydro-dynamic battery, or new or improved electro-magnetic apparatus, which, with its products, are applicable to the production of motive power, of light, and of heat.

Dated March 23, 1853.

705. James Allen. Certain improvements applicable to the safety-valves of steam boilers or generators.

706. John Henry Park and Joseph Park. Improvements in water-closets and urinals.

707. Jean Baptiste Massat. Certain improvements in the manufacture of knives, and other similar handle instruments.

708. Bernard Boyle. A centripetal flange.

709. Hesketh Hughes and William Thomas Denham. Improvements in pianofortes, organs, seraphines, and other like musical instruments.

710. William Mann Crosland. Improvements in block making machinery.

711. Antoine François Jean Claudet. Improvements in stereoscopes.

Dated March 24, 1853.

712. Charles William Siemens and Joseph Adamson. Improvements in rotatory fluid-meters.

713. John Beaumont. A new manufacture of certain descriptions of woven fabrics.

714. William Prior Sharp. Certain improvements in machinery for spinning and doubling cotton and other fibrous substances.

715. Robert Grundy and James Jones. Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

716. Charles Victor Frederic de Roulet. Certain improvements in the manufacture of piled figured fabrics by alterations in, and additions to, looms for weaving, including also a warping-machine, with a method of reading and arranging the colours or materials for the patterns of such figured fabrics.

717. Henry Webster and Edward Dawson Sones. Improvements in the construction of gas-stoves.

718. William Keates. Improvements in the manufacture of tubes and mandrils. Partly a communication.

719. Charles Augustus Holm. Improvements in propelling vessels.

720. George Isaac Jackson and Henry David Jackson. Improvements in fasteners for buttons.

721. William McNaught. Certain improvements in steam engines.

722. William Edie. Improvements in the treatment or manufacture of textile materials.

723. Robert Walker. Improvements in working and increasing the safety of railways.

Dated March 26, 1853.

724. Erasmus Symonds. An improved self-acting plug for barges, boats, and other vessels.

728. Thomas Smedley. Certain improvements in steam boilers.

730. Richard Archibald Brooman. An improved rag-tearing and separating machine. A communication.

731. George Robb. Improvements in the manufacture of sulphuric acid, alkalis, and their salts.

732. James Worrall, junior. Certain improvements in the method of preparing, treating, and finishing cut, piled, or raised fustians, and other similar goods or fabrics, and in the machinery or apparatus connected therewith.

Dated March 28, 1853.

733. George Oakes Asbury. An improvement or improvements in the manufacture of dowls used in joinery.

734. John George Truscott Campbell. Certain Improvements in ships' propellers.

735. David Stephens Brown. Certain improvements in engines to be worked by steam, or any other elastic fluid, which invention also includes the apparatus for generating such steam, or other elastic fluid.

736. Augustin Chrysostome Bernard and Jacques Marie Pierre Albéric de St. Roman. An improved mode of giving publicity.

737. Thomas James Perry. Improvements in printing.

738. John Scott, junior, and George William Jaffrey. Improvements in steam engines.

739. Samuel Fox. An improvement in the frames of umbrellas and parasols.

741. George Edward Dering. Improvements in the manufacture of certain salts and oxides of metals.

Dated March 29, 1853.

742. Samuel Bayliss. Improvements in the construction of ships and vessels.

743. James Webley. Improvements in the construction of repeating or revolving and other pistols and fire-arms.

744. Luke Smith and Matthew Smith. Improvements in machinery for weaving and printing.

745. Thomas Hill. Certain Improvements in springs, and also in the modes of their application to railway engines and carriages. A communication.

746. Samuel Newton. A self-acting friction-break to be applied to engines, carriages, and wagons used on railways.

748. Robert Heath. Improvements in railway breaks and signals.

749. Isaac Rider. Improvements in cocks for drawing off beer or other liquids.

750. Lawrence Frederick Keogh. Improvements in looms for weaving.

751. John Gray. Improvements in the application of heat for baking.

752. William Henham. Improvements in ploughs.

755. John Pym. Improvements in the permanent way of railways.

756. George Shaw. Improvements in the manufacture of knives and forks.

757. Julian Bernard. Certain improvements in boots, shoes, and clogs, and in the machinery or apparatus and materials connected therewith.

758. John Coope Haddan. Improvements in railway carriages.

Dated March 30, 1853.

759. Martin Billing. A new or improved method of constructing the walls of houses, hot-houses, and other buildings, which said method is also applicable to the construction of fences.

760. William Henham. Certain improvements in regulating the draught in chimneys and other outlets for smoke, air, and vapours.

762. James Bowron. Improvements in the manufacture of crown, sheet, plate, and bottle glass.

763. Christopher Nickels. Improvements in weaving narrow fabrics.

764. Robert Dalglish. An improvement in dyeing.

765. John Carter Ramsden. Improvements in looms for weaving.

766. Joseph Xavier Villiet, ainé. Certain improvements in the production of aërated liquids.

767. James Houston. Improvements in weaving.

768. James Worrall, junior. Certain improvements in the method of preparing, treating, and finishing certain textile fabrics called cords, thicksets, velveteens, and beaverteens.

769. Lot Faulkner. Certain improvements in the method of obtaining motive power.

Dated March 31, 1853.

770. William Augustus Pascal Aymard. Certain improvements in applying to illuminating the extract of bituminous products of coal, peat, and lignites, and in rectifying and epurating the essences and greasy matter from coal. A communication from P. J. Salomon, of Paris.

772. Robert Mc Gavin. Improvements in the construction of ships' masts, yards, booms, and in spars.

774. John Radcliffe. Improvements in looms for weaving.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 8*th*, 1853.)

637. William Pope. Improvements in the ventilation of ships.

658. John Ryall Corry and James Barrett Corry. A new method of sewing gloves.

717. William Davis. Improvements in machinery for cutting files.

718. William Edward Middleton. A new or improved circular saw-bench.

723. Daniel Henwood. Improvements in machinery for regulating the number of passengers or persons entering public vehicles or vessels, theatres, bridges, or other places where it may be desirable to ascertain the number of persons entering therein.

(*From the "London Gazette," April* 12*th*, 1853.)

696. John Down Gordon. Improvements in tuning pianofortes.

750. John Mirand. Certain improvements in the construction of electric apparatus for transmitting intelligence.

773. Henry Russell. Improvements in pianofortes.

781. James Hume. Improvements in water-closets.

855. Robert Mortimer Glover. Improvements in coating the bottoms and other parts of ships and vessels, in order to prevent animal and vegetable growth in contact therewith.

869. Adam Ogden and John Ogden. Improvements in machinery for spinning cotton or wool.

870. James Ward Hoby and John Kinniburgh. Improvements in the manufacture of metal castings.

887. Thomas Wood. Improvements in the mode of obtaining motive power.

942. Peter Walker and Andrew Barclay Walker. Improvements in fermenting ale and porter, and other liquids.

961. Joseph Cliff. Improvements in the mode of making and compressing bricks, lumps, tiles, quarries, terra-cotta, and other similar articles.

988. Samuel Aspinwall Goddard. Improvements in the construction of pistols.

993. Peter Armand Lecomte de Fontainemoreau. Improvements in the machinery for applying metallic capsules. A communication.

1072. Peter Armand Lecomte de Fontainemoreau. An improved lamp, which he calls "Lamp Omnibus."

238. Lewis Jennings. An improved construction of lock.

330. William Romaine. Improvements in rendering wood more durable and uninflammable.

412. William Bridges Adams. Improvements in railways.

449. William Wilkinson. Improvements in the manufacture of ropes, bands, straps, and cords.

581. Jacques Francisque Pinel. Improvements in deodorizing sewage water and cesspools, and in manufacturing manures.

650. John Vanden Hielakker. An improved eccentric engine, applicable to the purposes of general navigation.

660. George Johnson. Certain improvements in looms for weaving.

666. William King Westly. An improved comb or gill for heckling, drawing, roving, and otherwise preparing to be spun, hemp, flax, tow, silk, wool, and other fibrous substances.

671. John Haskett. Improvements in grinding stones and whetstones. A communication.

677. George Ross. An improved manufacture of lubricating oil, and a mode or modes of applying such oil to the purposes of lubrication. A communication.

678. George Mackay. Improvements in the manufacture of iron. A communication.

686. Alfred Vincent Newton. An improved construction of oil lamp. A communication.

701. William Johnson. Improvements in rolling and shaping malleable metals. A communication.

708. Frederick Putvoye. An improved apparatus to be employed in games of chance.

710. William Mann Crosland. Improvements in block-making machinery.

711. Antoine François Jean Claudet. Improvements in stereoscopes.

714. William Prior Sharp. Certain improvements in machinery for spinning and doubling cotton and other fibrous substances.

718. William Keates. Improvements in the manufacture of tubes and mandrils. Partly a communication.

719. Charles Augustus Holm. Improvements in propelling vessels.

730. Richard Archibald Brooman. An improved rag-tearing and separating machine. A communication.

732. James Worrall, junior. Certain improvements in the method of preparing, treating, and finishing cut, piled, or raised fustians, and other similar goods or fabrics, and in the machinery or apparatus connected therewith.

734. John George Truscott Campbell. Certain improvements in ships' propellers.

736. Augustin Chrysostome Bernard and Jacques Marie Pierre Albéric de St. Roman. An improved mode of giving publicity.

739. Samuel Fox. An improvement in the frames of umbrellas and parasols.

746. Samuel Newton. A self-acting friction-break to be applied to engines, carriages, and wagons used on railways.

760. William Henham. Certain improvements in regulating the draught in chimneys and other outlets for smoke, air, and vapours.

762. James Bowron. Improvements in the manufacture of crown, sheet, plate, and bottle glass.

763. Christopher Nickels. Improvements in weaving narrow fabrics.

764. Robert Dalglish. An improvement in dyeing.

768. James Worrall, junior. Certain improvements in the method of preparing, treating and finishing certain textile fabrics called cords, thicksets, velveteens, and beaverteens.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 9, 1853.

1852:

313. John Egan.
344. Samuel Perkes.
346. Samuel Perkes.
397. Henry Moseley.
406. Andrew Blair.
431. Henry Hughes and George Firmin.
437. Arthur James.
477. Henry Charles Gover.
499. James Brodie.
541. Thomas Wilks Lord.
567. Richard Archibald Brooman.
572. Henry Brinsmead.
626. Charles Phillips.
640. Marc Klutz.
876. Jean Hippolyte Salvan.
910. Jules Barse and Paul Gage.
1030. Stephen Green.
1167. John Anderson.

1853:

27. Frederick Arnold.
106. Charles Vion Hippolyte.
162. Benjamin Quinton.
171. Henry Brinsmead.
179. John Henry Johnson.
285. John Verinder Kiddle.
309. John Dudgeon.
310. Jacob Vale Asbury.
326. Alexander Parkes.
346. John Seaward.
401. Job Cutler.
431. Frank Clarke Hills and George Hills.
433. Charles Cowper.
434. Charles Nightingale.

Sealed April 13, 1853.

1852:

366. Joseph Nash.
374. Christopher Hill.
375. Gerard Andrew Arney.
379. John Henry Lee.
396. James Lochhead and Robert Passenger.
417. Pierre Augustin Puis.
424. John Henry Johnson.
443. William Chisholm.
484. George Ellins.
526. James Nasmyth.

527. Joseph Charles Frederick Baron de Kleinsorgen.
537. Robert William Bertolacci.
546. James Nasmyth.
634. Emily Pettit.
649. Andrew Lawson Knox.
784. Robert Walker.
936. John Norton.
1209. Thomas Benjamin Smith.

1853:

13. Lazare François Vaudelin.
102. Frederick Joseph Bramwell and Isham Baggs.
255. Edmund Leach.
324. John Campbell.
327. Edward Palmer.
348. Charles Iles.
349. John Webster.
360. George Hutchison.
365. Sir James Murray.
396. William Blissett Whitton and George Samuel Whitton.
403. George Gay Mackay.
407. John George Perry.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
April 5	3441	Mrs. Groom	Walworth	Abdominal belt.
6	3442	Marsh Brothers and Co.	Sheffield	Table-knife.
7	3443	J. Fryer	Charing Cross	Despatch-box.
7	3444	J. C. Gunn	Edinburgh	Collar for pipes.
13	3445	J. Paterson	Wood-street	Shirt front.
14	3446	F. J. Jones	Addle-street	Buckle.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

April 5	499	S. Harris	Houndsditch	Shirt.
8	500	J. Simons	Birmingham	Writing-case and taper-stand.

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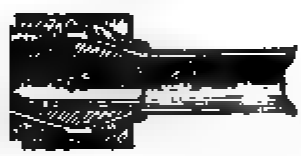
LACEY'S PATENT APPARATUS FOR RAISING FLUIDS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4



LACEY'S PATENT APPARATUS FOR RAISING FLUIDS.

(Patent dated October 12, 1852.)

The object of this apparatus is to render available a fall of water directed into a receiver of peculiar form, for the purpose of raising another body of water through a given space. A second portion of the patent describes the means by which the contents of a cask may be raised by employing the same moving force; and a third embraces a collateral object of utility, by describing the mode of forming a new joint for India-rubber, and flexible tubing generally, which dispenses with the application, for many purposes detrimental, of artificial cements.

Fig. 1 is a sectional elevation of an apparatus adapted to raise water to the upper part of a building. A A is a vessel divided into two compartments by the flexible diaphragm, B D B. C is a vulcanized India-rubber tube, connected at one end to the diaphragm at *d*, and at the other end to a tube, E. H is a cord or chain connected to the centre of the diaphragm, and passing through the tube, E, and over the pulley, J. L is a pipe leading from a water-tank above, and containing the water which is to be raised to the upper compartment of the vessel, A A. M is an ejection-pipe for conveying the water to its destination. N is another pipe for conveying waste water from a receiver into the vessel, A. Under the diaphragm, O and P, are three-way cocks, fixed on the pipes, M and N, and connected by the rod, Q. R and S are weighted levers, for the purpose of reversing the cocks, O and P, and are alternately raised by the cards, W W, passing over a pulley, Z. U and V are arms on the axis of the pulley for raising the catches, X X¹, and relieving the weights, R and S, in the manner explained below.

The figure represents the state of the apparatus when charged for delivering a supply of water to the upper part of a building. The weight, R, is represented as having been released from the catch, X, by the arm, U, whereby it has reversed the cocks, O and P, so that the cock, O, opens up a communication between the lower part of the pipe, L, and the pipe, M, while it closes the communication between the lower and upper parts of the pipe, L. The cock, P, opens a passage from the pipe, N, to the pipe, *n*, fitted to the bottom of the vessel, A A, under the diaphragm, B D B; and waste water being now discharged from any given elevation through the pipe, N, will flow through the open passage in the cock, P, into the vessel, A A, under the diaphragm, B D B, which it will raise, thus forcing up the water above it in the vessel, A A, to nearly about the level of the vessel from which the waste water was discharged. The rise of the diaphragm, and the retraction of the vulcanized tube, C, puts the pulley, J, in motion, which being assisted by the weight, T, fixed on the periphery thereof, brings up the arm of the weighted lever, R, until the weight on the end thereof is held by the catch, X. At the same time the arm, V, on the axis of the pulley liberates the weighted lever, S, from the catch, X¹, whereby the cocks, O and P, are reversed; that is to say, communication is closed between the pipes, L and M, and opened between the two parts of the pipe, L; the passage in the cock, P, from N to *n* is closed, while that between *n* and G a final discharge-pipe is opened. A fresh supply of clean water will flow from the reservoir through the pipe, L, into the vessel, A A, will depress the diaphragm, and drive out the water under it through the pipe, *n*, and open passage in the cock, P, into the final discharge-pipe, Y. The apparatus is now again in the position shown in the figure, and ready to continue its action in the same manner.

Where liquids such as beer are required to be raised from the cellar to the bar, the patentee proposes to insert a flexible diaphragm about the centre of the barrel, or other vessel in which it is contained. When the barrel is being filled, the diaphragm will be expanded against the end of the barrel, opposite to that at which the beer is admitted. An orifice for the admission of compressed air, or of a column of fluid, is provided behind the diaphragm, on the admission of which the beer will be forced upwards. Beer stored in vessels of this construction will be found to keep good a considerable time, as atmospheric air is altogether prevented from mixing with it.

Fig. 3 is a section of the joint for uniting two lengths of India-rubber or other flexible tubing. A is the body of the joint; B B, two collars which screw into a thread on the body, A. One collar is placed upon each of the ends to be joined; the ends are then each brought over the conical part of the body, A, and the two collars are brought up and screwed thereto.

Where a length of India-rubber, or other flexible tubing, is to be united to a metal tube, the patentee employs one collar only, and connects the body of the joint on which the

screw-thread is formed to the metal tube. Where liquids which would act upon metals are to be passed through the tubes, he forms the joint as shown in fig. 4. A A is a piece of gutta-percha, glass, or other substance not liable to be acted on, which is inserted into the two ends of the tubes to be united, having, as before, passed one collar over each end of tube. One collar is tapped with a male, and the other with a female thread; the collars are brought up, screwed together, and thus form a perfectly tight joint. Fig. 2 shows the elevation of the joint.

THE CALORIC SHIP "ERICSSON."

The *Ericsson* lies at her dock in Williamsburg, where improvements are being made in the machinery. The main difficulty hitherto encountered has arisen from the want of a perfect connection of two sections of an air-pipe, near the bottom of one of the cylinders. Though connected by rivets, the working of the engine prevented such a perfect union of the parts as to allow of the full use of the power otherwise available. It is said that it has been determined to substitute a single casting for the defective parts, and that the difficulty will be obviated at once. This change is now being made. The other engine has been perfect throughout; and when both are complete, it is believed that the *Ericsson* will be in a much better condition to prove her capabilities.—*New York Herald.*

The following calculations, referring to this vessel, are taken from an article in the February Number of the *Journal of the Franklin Institute*. They are directed to the principal advantages claimed by Captain Ericsson for the application of the caloric principle in navigation; viz., economy of fuel, economy of space required for machinery and coal, and superior safety from fire and explosion:

Economy of Fuel.—Knowing the consumption on board the *Ericsson*, the first step in a comparison to determine this point is to calculate the size and consumption of steam engines developing the same force. The working cylinder of a caloric engine, as now made, bears to that of a steam engine—

1st. As being single instead of double acting	2 to 1
2nd. As having only $\frac{1}{3}$ of its area effective, owing to that of the supply cylinder being $\frac{2}{3}$	3 to 1
3rd. As using a pressure of 8 lbs., while in Collins' steamers 16 lbs. cylinder pressure is obtained, 12½ vacuum, cutting off at $\frac{1}{3}$ = 19·25 lbs. effective pressure	2·406 to 1
A proportion equivalent to (2 × 3 × 2·406)	= 14·436 to 1

Now, the *Ericsson's* working cylinder capacity consists of 4 of 168 inches by 6 feet, having a collective stroke displacement of 3696 cubic feet. Therefore, the steam cylinder must have

$$\frac{3696}{14 \cdot 436} = 256$$

cubic feet capacity, which, cutting off at $\frac{1}{3}$ in two single strokes, gives

$$\frac{256 \times 2}{3} = 170 \cdot 67 \times 60 \times 10\tfrac{1}{2}$$

revolutions = 107522 cubic feet steam per hour, or (at 853 = volume of steam at 16 lbs.)

$$= \frac{107522}{853} = 126 \times 64\tfrac{1}{3} = 8106 \text{ lbs.}$$

of water per hour, requiring a combustion of

$$\frac{8106}{7 \cdot 54} = 1075 \text{ lbs. per hour.}$$

That of the *Ericsson* was 550 lbs., or 51 per cent. of the above.

But upon the trials, the leakage of air is stated to have been great, owing to the action of the heat on the lower valves and seats, and to the unequal expansion of the working cylinder during the operation of the engine, its lower diameter having increased one-half inch more than the upper diameter; and as there was not enough

elasticity in the piston springs to push out the packing, the leakage at the lower part of the stroke was considerable. We may take the whole leakage at 20 per cent.

On the presumption that the temperature to which the air was raised did not exceed that required to double its volume at 60°, this leakage might have amounted to 20 per cent. of the whole working cylinder, or

$$\frac{\cdot 20}{\cdot 67} = 30$$

per cent. of that actually used. Should the *whole* of this be in future overcome, either the pressure would be slightly increased with the same consumption, or the fuel would be reduced, the pressure remaining the same, in the proportion of 1·30 to 1·00, or from 550 to 423 lbs. per hour—at which, in this comparison, it will be taken. This would be equal to nearly 40 per cent. of that of a steam engine.

The difference between this amount of fuel (423) and the amount required by calculation (108) to raise the volume of 1,548,240 cubic feet = 120,920 lbs of air 30° the amount not to be returned by the regenerator, is enormous, being nearly 4 to 1; and it is probably owing in part to the radiation from the heated parts, and principally to the imperfect operation of the regenerator.

As to the economy in working, we have no account of the amount of lubricating material to be used in warm cylinders, having nearly 1000 square feet of surface to be kept greased.

Economy of Space.—We have now to consider the second advantage claimed, which is partially estimated on the reduction in amount of fuel for a transatlantic voyage, as occupying more room than that required by the new engine; and begin by a calculation of the power required to drive the *Ericsson* on the ocean at a speed equal to that of the Collins steamers. A few figures will show that, to obtain this power in the *Ericsson*, her caloric engines would have to be increased to a size rendering the justice of this claim doubtful.

The Collins steamers will make at the termination of a voyage (in New York Harbour), 13½ geographical = 15·55 statute miles per hour, with the steam pressure above taken, and making 17 turns per minute of a wheel 33 feet 3 inches effective diameter. At the same slip, the wheels of the *Ericsson*, making 10½ revolutions of 30¾ feet effective diameter, should have driven her 8·873 miles per hour, which we shall allow as her actual speed. That this speed is inadequate for transatlantic navigation, will be readily seen from the following comparison:

Collins steamers make in still water	15·55		statute miles per hour.	
" " on an average of 3190 hours steaming, a mean speed of	13·44		"	"
Reduction of speed by weather, etc.		2·11	"	"
Speed of the *Ericsson* in New York Harbour ..	8·87		"	"
Deduct as above	2·11		"	"
Average speed to be expected ..	6·76			

The mean of twelve passages between New York and Liverpool, gives as the distance 3080 geographical miles (of 6082⅔ feet) = 3548 statute miles. At the rate of 6¾ miles per hour, this would require 524 hours = 21 days 20 hours length of passage, which is not less than the average trips of the clipper ships.

To obtain 15·55 miles with the *Ericsson* would require 18⅜ revolutions per minute. Now the power required to drive a vessel is as the cube of the speed—therefore, to make this latter speed would require

$$\frac{(15\cdot 55)^3}{(8\cdot 873)^3} = 5\cdot 375$$

times the power actually developed on the trial. Unless the working pressure were increased, which could not be done without augmenting the area of supply cylinders, and consequent back pressure; or the temperature which would destroy the cylinder bottoms with a rapidity in a far higher ratio than that of the increase of heat; or by cutting off shorter (thereby slightly augmenting the initial pressure), which would involve a higher per centage of leakage; the capacity of cylinder developed per minute must be increased 5·375 times, or would have to be

$$\frac{3696 \times 10\tfrac{1}{2}\text{ revs.}}{18\cdot 375\text{ revs.}} \times 5\cdot 375 = 11341$$

cubic feet, or with the same stroke (6 feet) = 1890 square feet collective area, equal to four cylinders 24 feet 6 inches diameter, with supply cylinders 20 feet 2 inches diameter.

The consumption of fuel would be 423 × 5⅜ = 2279 lbs. per hour = 24⅜ tons per diem.

The same work could be done by two 90 inch × 8 feet cylinders with the above pressure and revolutions, and the consumption

of fuel would be about 5000 lbs. an hour = 60 tons a day. The coal saved in a trip of 12½ days would therefore be 35⅝ × 12½ = 445 tons occupying 15,575 cubic feet.

Now a pair of 90's × 8, oscillators, could be very readily put into an area of 30 × 15 = 450 square feet, which, by the whole depth of ship is 450 × 22½	= 10,125	cubic feet.
And tubular boilers, with fire-room between, into an area of 34 × 32 × 14 deep	= 15,232	" "
While the extra coal space required is	15,575	" "
Total	40,932	" "

Four caloric engines 24½ × 6 feet would require an area of *at least* 115 feet in the length of the ship, and 30 feet in width, which by the whole depth (throwing off the projection above deck) 22½ gives 115 × 30 × 22½ = 77,625, or more than 1⅞ times the space required for steam engines of equal power.

Safety.—As regards safety, the chances would be decidedly in favour of the new plan. Experience, however, does not show that this advantage, or that of cheapness in passage, is properly appreciated when accompanied by reduced speed; and it is very doubtful whether engines of the size above named *could*, or would be put into a ship of the *Ericsson's* dimensions, in which case her speed would undoubtedly be too slow to ensure popularity.

We have seen, then, 1st. That a saving of fuel of 60 per cent. may be effected; 2nd. But that the space required would be 90 per cent. more than that occupied by steam engines, boilers, and the saving of coal. In addition to which it must be recollected that in our comparison, the caloric engines were developing nearly their full power, while the steam engines were cutting off at one-third stroke; consequently, in heavy weather, a very slight increase of pressure on the pistons could be relied on in the former. The capability of following steam the whole stroke in a gale of wind ahead, is of material advantage to ocean steamers.

As to river steamers, the difference of space and weight becomes even greater as the amount of coal to be carried is trifling. We think the inference must be drawn from the foregoing, that unless some material change is made in the caloric engine as at present constructed, it is highly improbable that it will ever take the place of steam engines on fast steamers; and as regards freighting vessels, that clippers making average passages of 20 to 25 days across the Atlantic, will probably not be superseded by vessels in which so large a space is taken up by machinery and coal, of which the expenses of running and wear and tear cannot be insignificant, and whose passages will not be averaged in less time.

This inference, however, it must be recollected, does not involve the failure of the object held in view in the construction of the *Ericsson*. That object, we presume, was to show that, by certain peculiarities of construction introduced by Captain Ericsson into the engines hitherto used with air, their permanent or continuous operation might be secured, so that the mechanical difficulties (such as heavy losses from friction and leakage, rapid oxydation of metal, &c.), which have hitherto prevented that class of engines from extended use in practice, might be removed. That question cannot be decided in a few hours; it is the work of time, with its usual experience; and if that experience shall show that the object above alluded to has been accomplished, it is not impossible that *the Caloric Engine* may be extensively employed in pumping or drainage, or in the many branches of manufacture where economy of fuel is the grand consideration, and there is no limit to the space or weight of the machinery to be employed. In view of these great manufacturing interests to which the benefits of Captain Ericsson's invention would accrue, it is earnestly to be hoped that time will show the justice of his long-continued confidence in his favourite project.

EXPERIMENTAL TRIP OF THE "VICTORIA."

The following account of a series of important and interesting experiments performed with the *Victoria* screw steam ship, on her recent trial trip in the North Sea, has been supplied to us by a gentleman who was present, and took part in them.

This splendid ship, the property of the Australian Screw Company, was built by Mr. Scott Russell on his wave-line theory. She is 267 feet long on the water-line, 38 feet broad, and at the time of trial had a draught of water 10 feet 8 inches forward, and 16 feet 10 inches aft. She will ulti-

mately have a mean draught of about 17 ft. Her registered tonnage is 1,853, and she is fitted with four masts.

Her engines are direct-acting, on the oscillating principle, consisting of four cylinders, of the conjoint nominal horse power 450: length of stroke 33 inches, fitted with a very simple and elegant self-lubricating apparatus. The screw has two blades, 14 feet diameter, and 22 feet pitch; each blade being one-sixth of an entire convolution. She carried on the trial 750 tons of coals. The main shaft is furnished with a very ingenious, simple, and beautiful apparatus for connecting or disconnecting the screw, by means of which, either of these operations can be readily performed by one man in the short space of 30 seconds. I shall endeavour to give some idea of this apparatus. The shaft may be conceived to consist of two distinct portions: the aft part, to which the screw is attached, terminates in a large wheel: the fore part driven by the engines terminates in a large strong iron band, or rim, working outside of the wheel above mentioned, and capable of being tightened over, or loosened from it by means of a screw working in a projecting collar on the outer circumference. This screw is worked by a second screw, whose motion is regulated by two systems of toothed wheels. There are two friction-breaks, one attached to the fore, and the other to the after shaft. By pressing down that on the fore shaft, a toothed wheel attached to it engages in a wheel on the shaft, and communicating with the screw above described separates the two faces of the collar, and disconnects the screw. By pressing down that on the aft shaft a similar contrivance brings the two faces together, and connects the screw, by making the wheel terminating the aft shaft and the embracing band one solid mass.

A considerable number of gentlemen accompanied Mr. Scott Russell on the trial, including the Chairman of the Company, Mr. Brunel, C.E., several Post Captains, R.N., of great experience, and others interested in screw propulsion. The chief trials took place during the 17th instant.

The first experiment had for its object to ascertain the speed and consumption of fuel when working expansively. The engine was therefore worked on the highest grade of expansion, in which 6 inches of steam only are admitted into the cylinder. The speed of the vessel was then ascertained to be at the mean rate of 9¼ knots per hour; the number of revolutions 47, pressure of steam 12. The consumption of coal during two hours of expansive working, was, for the first hour, 1 ton 3 cwt. 7 lbs., and for the second, 1 ton 4 cwt., giving an average of 27 tons per 24 hours.

In the afternoon she was tried at full speed on a run from the Kentish Knock Light to a buoy on the Margate Roads, a distance of 14 knots; which she performed against a considerable head wind in 1 h. 30′, giving a result of 9¼ knots per hour. From the character of the coals used, it was difficult to maintain the full pressure of steam. The number of revolutions varied from 50 to 59, averaging about 56; the maximum speed, however, with the maximum number of revolutions, was 11 knots, as ascertained by the log; the steam pressure averaged 15 lbs., the escape valve being loaded to 18 lbs. The consumption of coal during this trial was at the rate of 37 tons per diem.

From these two experiments the advantage of expansive working of the steam was clearly deduced; as under similar circumstances a saving of 10 tons of fuel in the 24 hours was accompanied by a reduction of only 1¾ knots per hour in the speed. At about 8 o'clock the screw was disconnected and allowed to revolve freely. The vessel was then tried on a wind, and found to make 5½ knots, and steered admirably, and stayed well on both tacks. Throughout the whole of the sailing trials the wind was very moderate from the west. Running free with all plain sail set, and drawing (the screw still revolving freely and disconnected), she made good 8½ knots per hour, passing several light colliers going north.

The screw, still disconnected, was then fixed in a vertical position, when the speed of the ship was immediately reduced by 2½ knots, and she would hardly steer, the helm being obliged to be placed hard-a-weather to keep her on her course. The screw was then fixed horizontally at right angles to its former position; when the steering was found to be little affected, and the reduction of speed was not so great as before, though still very considerable, at least 1¼ knots.

From these experiments it would appear that with the screw disconnected and running free, the steering and speed of a ship are nearly as perfect as when the screw is raised out of the water; and also that there is great damage both to steering and speed in keeping the screw fixed in any position. Whence also may be inferred the advantage of furnishing screw-ships with such an apparatus as has been described for readily and easily disconnecting and connecting the screw.

The naval gentlemen on board expressed their high satisfaction at the sailing qualities of the *Victoria*, and their belief that with a tolerable breeze she would attain at least as high a speed under canvass alone as with the screw.

All on board, whether naval or scientific men, were highly gratified with the results of the trial; and considering that the *Adelaide*, with which so much fault has been found, is a sister ship, it was agreed that her misbehaviour is not fairly attributable to the architect and engineer, but is due to some other cause, on which perhaps some light may ere long be thrown.

When the vessel was moving at her maximum speed, I carefully observed the water at her bows. She seemed to cut through the water like a knife; nothing like a wave or accumulation of water forward being observable; so far showing that one main object which Mr. Scott Russell has, in his peculiar form of construction, is attained. If she be properly handled, there can be no reasonable doubt but that those who embark in her for our antipodes will experience a speedy, safe, and prosperous voyage.

METEOROLOGICAL AND HYDROGRAPHICAL OBSERVATIONS AT SEA.

The well-conceived idea of establishing a general system of meteorological and hydrographical observations at sea, to be concurred in by the principal maritime nations, appear now to be in fair train for satisfactory settlement. To construct accurate charts of winds and currents, so desirable for the requirements of modern navigation, is the great object of the endeavours of those by whom the project has been advanced. Lieutenant Maury, the Secretary to the United States Navy, so well known in reference to great circle sailing, has actively co-operated in urging forward this scheme, which promises so much to advance the existing confines of physical science. The correspondence which has already taken place between the Governments of Great Britain and of the United States, which has just been presented to the House of Commons, discloses a reciporcity of good feeling as to the expediency of the undertaking, in point of principle, which is equally creditable to both. The adjustment of details still remains to be accomplished, but this cannot long impede an attempt, at least, to carry the plan into execution. With regard to the universality of the system, that point has received the attention of the Royal Society, which has expressed its opinion against the practicability of any plan of this nature.

HISTORY OF MATHEMATICAL PERIODICALS.

In our last Number we published the first part of Mr. T. T. Wilkinson's article on *The Liverpool Apollonius*, forming the 28th Number of his Series. We now supply the

Questions.—The mathematical questions answered in this periodical are not very numerous, but several of the *senior* course possess considerable interest. In their selection, Mr. Swale appears to have had constantly in view either the removal of some acknowledged difficulty, or the placing of a known subject in a new light.

Question 1, in the *junior* course, is proposed by J. H. Swale, junior, and gives an elegant method of determining the diameter of a given circle when the centre is not known.

Questions 2, 3, 4 of the same course relate to the Apollonian Problem of Tangencies, and furnish examples of the utility of the editor's paper on that subject. In the portion devoted to algebra, we find improved solutions to several of the most difficult quadratics in Dr. Bland's *Algebraical Problems*, together with a neat solution of a "Scrap of Analysis said to have been found in Professor Porson's pocket at the time of his decease."

Ques. 1 in the *senior* course furnishes a neat property of the Parabola, and is proposed by M. J. Macauley,—one of Mr. Swale's most promising pupils. Ques. 4 requires a circle that shall *touch* one given circle, *bisect* the circumference of another, and have a tangent drawn from a *given* point equal to a *given* line; a problem which may be immediately reduced to that of describing a circle through two given points to touch a given circle, by any paper on "Bisectant Axes" in the *Diary* for 1853. Ques. 5 furnishes another method of determining the diameter of a given circle, and gives rise to "several curious Theorems," one of which is enunciated at the close of Mr. Swale's own demonstration. Ques. 7 deduces "a Theorem of Maxima," not hitherto noticed elsewhere; and Ques. 8, and its consequences, supply several others on the same interesting subject. In the senior Analytical department several improved solutions are given to De Moivre's question in Sanderson's *Algebra*, p. 263, 4to. ed.; to a disputed problem in Diophantine Analysis; and to the system of equations known as "Colonel Titus's Problem." Mr. John Whitley, Mr. Samuel Ryley, and Mr. Wm. Settle appear to have furnished most of these elegant morsels to this department, and Mr. Swale himself is an extensive contributor under the signature Apollonius, and its numerous abbreviations. The "Problems for Solution," left unsolved, contain many interesting subjects of inquiry, and their discussion would have rendered the next Number of the *Apollonius* a real trea-

sure to the inquiring student. Several of the more simple problems in the two courses have since been discussed in the pages of the *Gentleman's Diary*, the *Mathematical Repository*, and the *Educational Times*, but the most interesting, and at the same time the most difficult portion, of this selection of 58 questions, has never yet found its way out of the extensive MS. collections of the gifted Editor.

Publication.—As previously intimated, the publication took place annually:—the work was printed by "T. B. Johnson, Liverpool;" the first Number was "published by G. and W. B. Whittaker, London;" the second by "Sherwood, Jones and Co., Paternoster-row," and was sold also by several of the principal booksellers in Liverpool, Manchester, and York.

T. T. W.

THE TRADES OF BIRMINGHAM.

In most of the great works, in which iron is the chief material required, and as a matter of course South Staffordshire, in which are situated the immense establishments of Sir Charles Fox, Mr. Geach, M.P., and other enterprising capitalists, the prosecution of the extensive undertakings in which those gentlemen are engaged, is being productive of great and extensive benefit. The demand for plates for ship-building, as well as for sheets, continues undiminished, and from the great activity that prevails in the mercantile marine there is every probability of a still further considerable increase of the demand. As an illustration of this, we may state that the Eastern Steam Navigation Company have decided to construct an iron steamer of 17,000 tons burthen for the East India service, under the supervision of Mr. Brunel. There are still brighter prospects than these before the South Staffordshire ironmasters.

The drop of 18*l.* in the price of copper, —and the idea of which some of our Birmingham manufacturers a few days previously laughed to scorn—has already given an impetus to some branches of business which were becoming languid and inactive. There are great orders in hand now, and also for wire required for the construction of electric telegraphs on the continent. The copper-tubing branch is very active, large quantities being exported to the Northern States of Europe, and to other parts of the world where gasworks are about to be established. The brass bedstead business has likewise never flagged, but appears to become more extensive notwithstanding the recent disadvantages under which the makers have been labouring. Messrs. Peyton and Harlow, and other great manufacturers, are in more than full employ, and are constantly engaged in working over-hours. Although this peculiar branch of brass foundry is but young in years, it has already become one of the most extensive and prosperous businesses carried on in the town of Birmingham, and is fast spreading in all directions. Brass bedsteads of the most elegant design and construction are now transmitted to almost every part of the world.

The gun trade continues exceedingly active, and the best possible understanding exists between the masters and the men. Some fresh Ordnance contracts are expected, which will give additional stimulus to the trade. The manufacture of pistols, chiefly revolvers of the better class, is still carried on with increasing activity—the greater portion of the work being intended for the Australian market.

In the glass trade the large houses are well supplied with orders, although the high price of fuel and of other articles used in the manufacture are no small impediment. In the stained glass branch very great progress is being made, and more has been done within the last few years to restore this splendid art than had been done in the last two centuries. There are at present some fine specimens at the houses of Messrs. Chance of Spon-lane, and Hardman and Co. The latter firm has lately opened an extensive establishment for the exclusive preparation of stained glass from the designs of the late Mr. Hugen; and in a few years there is every reason to believe that Birmingham will take the lead in this, as it has done in the manufacture of so many other articles.

The steel-pen trade was never better than it is at the present time. Thousands of hands, young and old, of both sexes, are employed at Messrs. Gillot, Hinks and Wells, Mitchell, &c., and some of the workmen are obtaining exceedingly high wages, some as much as 5*l.* per week.

The forthcoming Irish Exhibition is affording ample employment to numerous hands in various branches, and certainly no pains are being spared to produce articles of the best description. At the great works of Messrs. Winfield, Elkington, and Co., Jennings and Bettridge, and others, great activity prevails, and already many of the articles are on the eve of consignment.

THE IRON TRADE.

The ironmasters' meetings concluded at Dudley on Friday week; and, taking them as a whole, they were represented to have passed off very satisfactorily, and to have shown that the trade of the district is in a very healthy condition. If the orders given

by manufacturers of iron articles have not been so numerous or so heavy as on former occasions, it is owing not to a want of demand, but to a reluctance to buy at present prices. Purchasers imagine that there will be another reduction, and are hanging back on that account. The tone of the ironstone and coal market at Stourbridge gave little encouragement, however, to any immediate or important reduction in the price of iron. Notwithstanding the great extension of mining operations, the demand for stone and coal largely exceeds the supply, and prices are fully maintained. In some instances, the prices charged for coal, as compared with the prices exacted fifteen or eighteen months ago, have reached 75 per cent. These, however, have been in cases where coal has been delivered to ironfounders at some considerable distance from the pits. The feeling with regard to the stability of the present prices of iron at Dudley (April 15th) was a degree firmer than it was at Birmingham on the 14th—the larger firms being apparently determined to abide by the figures fixed upon a fortnight ago. The rumour, which it is hoped will prove correct, that the French Government will allow the introduction of British iron into that country free of duty, induces also great expectations as to the future.

Shropshire pig iron, which is considered the best, is quoted at 5*l.* 10s., and cold-blast Staffordshire at the same price; hot-blast Staffordshire 4*l.* 15s. The nominal price of bars and rods is 10*l.*, although for cash, or of inferior quality, it may be had at 9*l.* 10s. or 9*l.* 15s.; plates and sheets, 12*l.* Of course there are parties who, for various reasons, at all times and at all seasons will undersell, but the best makers at the present moment are not likely further to give way.

South Staffordshire.—The ironmasters' quarterly meetings have been held this week, and the present price is firmly maintained; in fact, it cannot be otherwise, so long as the price of coal and stone is kept up. 4*l.* 15*s.* is the quoted price for hot blast mine pigs, 10*l.* for bars and rods, and 12*l.* for plates and sheets. Needy parties will be found selling under these prices, as is always the case, but respectable firms are not likely to give way. The quarterly meetings have been largely attended, and a considerable amount of reserve is very apparent amongst purchasers, who fancy that there may be another reduction, and hold off from buying to any great extent. A great deal of bad iron is in the market, made from cinder and inferior stone, and is sold at a comparatively low rate; but pigs made from mine cannot be sold for less than the above quotations, if any profit is to be realised upon them, which is very clear when the price of material is taken into account. Some old contracts, which were made six months ago, at very low rates are not yet completed. Some of the hardware trades in the neighbourhood are rather dull, on account of the high price of iron and coal. Merchants will not purchase more than they can help, and are doing all they can to reduce their old stocks.—*Wolverhampton Herald.*

Glasgow Pig-Iron Market.—Glasgow, April 16.—The market for pig-iron has been very steady during this week, a moderate amount of business having been done in warrants, at from 54s. to 53s. 6d., cash, at which latter rate we close rather heavily, sellers prevailing with a few buyers at 53s. For shipping iron the prices are, No. 1, g. m. b., 54s. 3d.; No. 3, 53s. 6d.: No. 1, Glengarnock, Summerlee, or Coltness, 55s., and Gartsherrie 56s.; cash against bill of lading.

America.—By the steam ship *Asia*, which arrived at Liverpool on Sunday with advices from New York to the 6th instant, we learn that nothing of note was passing in the iron market of that city.

THE DUBLIN AND NEW YORK EXHIBITION BUILDINGS.

The works at the Exhibition building in Dublin have recently been pushed forward with considerable energy, and great progress has been made in several departments, particularly in the great central hall, for the speedy completion of which vigorous efforts are now being made. The half ribs for the eastern dome have been elevated, an operation of some difficulty, and more complicated than the raising of one of the great arches, with its span of 100 feet; inasmuch as the latter, when the tackle is properly adjusted, can be raised to its place at once; whereas the former must first be lifted upon a strong scaffolding level with the wall plate, and the tackle altered, in order to place it in its proper position. The half ribs being fixed in their places, and sheeted over, nothing remains to be done to the roof of the central hall but the completion of the skylights and the decoration of the interior; a considerable portion of the glazing has already been executed, and we believe the painting will be commenced without delay. The spandrels on the southern side of the great hall have all been put up, and the medallion frames inserted therein. We may here observe that a space has been partitioned off in the northern gallery as an "artists'-room," in which a number of skilful and intelligent painters are busily engaged in executing the medallions, representing the arms of foreign countries, of the prin-

cipal cities of the United Kingdom, of the Irish episcopal sees, and of the guilds of various trades, &c. The words "no admittance," painted in peremptory-looking letters upon the door, warn the visitor not to disturb the labours of the industrious occupants, but, peeping through the chinks of the boarding, he may perceive, emblazoned on canvass in gold and brilliant colours, the quaint emblems, curious devices, and fantastic monsters of heraldry. From what we have seen of these medallions, we think they will form a very appropriate, suggestive, and pleasing feature in the decorations of the building. The laying down of the floor of the central hall is progressing rapidly, and is now nearly finished. Three of the steps of the flight of stairs leading up to the semicircular dais on which the organ-loft is erected have been laid down, each step being formed of one continuous piece of yellow pine, 76 feet long. Midway between the centre of the hall and the dais a space has been left for a fountain, the base of which will be about 20 feet in diameter. A colossal statue will stand exactly in the centre of the hall, and, as we stated before, a magnificent fountain, 40 feet high, from the establishment of M. Audre, of Paris, will be placed at the eastern end. The fountains are to be supplied from a reservoir, which will be placed at the western end of the building, outside the northern hall. All the other works are going on favourably and rapidly. The flagway, 12 feet wide, in front of the building, is also progressing, and will soon be completed. It has already been laid down from the pathway of Lower Merrion-street, along the front of the southern hall, commencing with a graceful curve, and then following the outline of the building.

The Great Exhibition building intended for the world's fair, in Reservoir-square, New York, is also progressing tolerably, but not so fast as could be wished. From appearances, it will be hardly ready by the time appointed for its opening, namely, the 1st of May. It is probable, however, that it will be in full tide of success by the first or second week in June—perhaps before.

Already the property near the palace has risen enormously in rent and value. As much as 200 dollars per week have been asked for the occupancy of some of the temporary stores that are springing up in its vicinity. It is to be regretted that Reservoir-square is so far from the central and best portions of the city, and that it is surrounded with vacant building lots, and a sprinkling of houses that are by no means of the first class. In these particulars its location contrasts very unfavourably with Hyde-park, while the rough country round is in equal contrast with the sylvan and umbrageous beauties of Kensington-gardens. But then there is no Hyde-park or Kensington-gardens in or near New York. Indeed, the Crystal Palace is a noble speculation, but still a speculation of private indivduals, and not a national undertaking; and property-holders in the vicinity hold a large proportion of the stock. This is natural. At any rate, there will doubtless be a beautiful show, and we learn that at the latest dates Colonel Hughes, the representative of the American Association for the management of the American Crystal Palace, who was recently in London, reports very favourably as to the contributions to be expected from Europe. The Queen and Prince Albert, the Emperor of the French, the Pope, and the Sultan, are all reported as intending to contribute. Thus far England is down for 542 objects; France, 326; the Zollverein, 500; Holland, 142; and Italy, 100 statues. Colonel Hughes will visit all the European courts on his mission.

The directors have determined to organize a separate department of mineralogical, mining, and chemical products. Messrs. Benjamin Silliman, jun., and W. P. Blake, have been engaged to classify and arrange the specimens in this department, and it is expected that the mineral resources of both Europe and America will be richly represented. A geographical arrangement is also to be observed.

ON THE IRREGULAR MOTIONS OF LOCOMOTIVE ENGINES.

By Mr. Daniel K. Clark, C. E.

The following analysis of the various irregular motions of locomotive engines, the examination of their causes, and suggestions for their removal or diminution, is taken from Mr. Daniel K. Clark's *Railway Machinery*. The subject is at all times worthy of serious study, and the exposition of it given by Mr. Clark is at once ample and satisfactory.

The pitching movement.—The resistance to pitching, and thereby the stability, is promoted by shifting the driving axle backwards, towards the firebox, principally because it increases the mass of the machine in advance of the axle, or that which is submitted to the oblique action of the connecting-rod; the removal of the axle also, in so far as it lengthens the connecting-rod, reduces the obliquity which is the source of the disturbance. In Crampton's

engine, having the axle behind the firebox, the whole mass lies forward; while, at the same time, the guide-bars, where the action takes place, are in the neighbourhood of the centre of gravity; thus the oblique action is entirely controlled, and the pitching is extinguished.

Above all, the number and position of the points of support, mostly control the pitching. The springs also, particularly the fore-and-hind springs, should be as stiff as is consistent with the preservation of the frame and mechanism, to neutralize the oscillations which may arise from imperfections of the permanent way—such as loose sleepers, open joints, or want of correct gauge; for if these oscillations should coincide with the action on the guide-bars, they increase the straining of the machine, and the liability of the leading wheels to mount the rails. Susceptible springs, also, for the same reason, increase the danger from accidental obstructions.

Vertical action by the centrifugal force of the revolving weight.—This action may be entirely neutralized by the application of suitable counter-weights. This question, however, belongs to the more general question of balancing all the revolving and reciprocating masses.

The reduction of adhesion, by vertical action, explains the occasional slipping of the driving-wheels at high speeds. It explains also the extra wear of driving wheel-tyres, when very much out of balance, next the crank-pin, where the pressure on the rail is greatest, producing "flat places," and in consequence a vertical jolting of the engine while in motion.

Longitudinal fore-and-aft motion.—It was found that in the sample engine a joint longitudinal action on the driving axle of above six tons, or three tons for each cylinder, was incurred at certain points of the stroke, at a speed of fifty miles, by the crank and the other moving masses. Now the whole pressure of 100 lbs. steam on a fifteen-inch piston does not exceed eight tons; thus, the inertia of the mechanism alternately adds and subtracts three-eighths or 40 per cent. of this pressure, reducing the useful pressure to five tons, or 60 per cent., when the crank is at 45° during the first half-stroke; and raising it to eleven tons, or 140 per cent., at 135° in the second half-stroke. This example shows how very greatly the inertia of the machinery may affect the useful work of the engine. And so long as the whole effective pressure in the cylinder exceeds this inertia, the coupling bars between engine and tender remain taut on their pins, though subject to oscillation with the coupling spring. But when the steam pressure is less, or altogether removed,—with a small train, or going down an incline,—they play fast and loose, owing to the fore-and-aft action, by which the machine is alternately thrown forward and backward on the tender. This explains the extra racket and jarring which take place between an unbalanced engine and its tender immediately after shutting off the steam, in approaching stations, particularly where the nature of the coupling gear permits of some play. The shocks arising from these fore-and-aft vibrations are destructive to the coupling links and bolts, to the framing which carries them, and to the general connection of the whole machine, especially at the axle-boxes and guard-plates. And the greater the play of the parts of the engine, the more injurious is this action.

To neutralise or soften the longitudinal action, it is usual to employ a traction-spring under the foot-plate of the engine or tender, to receive the shocks; it is either coupled to a draw-bar of a fixed length, under permanent tension between the draw-bolts, or adjustable by a double screw, right and left hand; in either case, buffing blocks of wood are fixed at some distance apart laterally, upon the front beam of the tender-frame, to bear upon the engine-frame, as fulcrums for the action of the spring. With the object of softening the action still further, the buffing-blocks are in some cases made elastic within a limited compass, by the use of India-rubber springs. Counterweights, also, are applied to the wheels, and are efficient so far as they go: but they are for the most part much too light, as they are estimated for the revolving weight only.

The sinuous movement.—As this affection of the motion of the engine implies the lateral play of the fore and hind wheels upon the rails, the friction of the tyres upon the rails, due to this lateral displacement, is opposed to the motion, and its tendency is therefore to steady the engine. Accordingly, in practice, at the lower speeds, and when the intensity of the disturbing forces is low, the machine, though unbalanced, runs sufficiently steady in respect of sinuous motion, at speeds above thirty miles, the greater disturbing forces overcome the resistance to their development, and the sinuous motion becomes more violent, the higher the speed. Even in Crampton's ordinary engines, sinuous action becomes sensible when the speed reaches sixty miles.

Many things go to increase the sinuous motion to which engines may be predisposed by want of balance: such as a want of parallelism of the axles, unequal diameters of the

wheels, the wear of ruts or hollows in the tyres, the wear of the axle-boxes and bushes, which gives rise to longitudinal and transverse play at the axle-guards and on the journals, the outline of the rails, and sometimes a want of accuracy in the adjustment of the draw-bars. When the axles are not parallel, but incline towards each other on one side of the engine, their disposition is to roll the engine forward in a curved path, and always towards the same side, causing perpetual collisions between the flanges and the rail. This oblique tendency is injurious enough on the straight parts of the line, but it is much worse on curves which diverge towards the other side, and increases the liability to get off the rails. The same tendency is caused by wheels of unequal diameter on the same axle. Again; when the tyre wears hollow, the outer part, originally less, is left larger in diameter than the middle of the breadth of tyre. This state of wear reverses the action intended in coning the tyres, as the greatest diameter, instead of being next the flange, is shifted to the outside; and, whereas a properly-coned tyre constantly seeks to maintain the wheels in the centre of the track, a hollow tyre leads the engine continually astray, and subjects it to constant concussions against the rail. Play of the axles and axleboxes, by giving scope for irregular action, converts what without play would be a simple strain or flexure of the guards, into shocks upon the journals and wheels laterally. And it must be noted that though some degree of flexibility in the frame may be benefical for easy working and adjustment of the machine to the rails, when in good order, it is a very dangerous accompaniment for a slack and unsteady engine. That these varieties of tear and wear are all productive of unsteadiness is proved by the superior stability of a new engine, with all its parts well up to their gauges, and all its bearings taut.

The means employed to reduce the fore-and-aft movement operate also in reducing sinuous movement. A great extension of the wheel-base has also been employed with benefit, because it reduces the angular play of the wheels between the rails, and increases the command of the leading wheels in controlling erratic movements, by their frictional resistance transversely on the rails. In Crampton's engines, which carry out this principle to its limits, and impose the greatest loads upon the extreme wheels, the mass of matter in advance of the driving axle still further promotes the stability; and these engines, though they may not be balanced artificially, are practically steady at sixty miles per hour. But the great spread of wheels, though beneficial on straight lines, is prejudicial on the curves, and particularly in passing into sidings; for it is plain that the farther apart the extreme axles, the greater is the angle at which the leading wheel-flange meets the outer rail on curves, and the more severe is the labour of guiding the engine.

The springs between engine and tender, though useful for reducing the fore-and-aft motion, have been introduced chiefly to meet the horizontal oscillation. But it is clear that, in so far as they, and all similar appliances, reduce this movement, they tend to consolidate the engine and tender, and injuriously to increase the length of fixed wheel-base. A draw-spring between engine and tender is no doubt a good thing; but it should be employed rather as a mere carriage-spring, to soften the irregular motions of the tender itself. The wheel-bases of locomotives are abundantly long enough for the fair purposes of a carriage, and it is mechanically unsound in principle, and inexpedient in practice, to divert them from their legitimate function; for, as M. le Chatelier most justly observes, "It is only in a direct manner—by attacking and destroying the cause itself—that we should seek to extinguish the lateral oscillation of locomotives."

INSTITUTION OF CIVIL ENGINEERS.

Sitting of Tuesday, April 12.

The chair was taken by James Meadows Rendel, Esq., the President, and the Paper read was "On the Concussion of Pump Valves," by Mr. W. G. Armstrong, Assoc. Inst. C.E.

In the construction of force pumps, acting under heavy pressure, for working Hydraulic Cranes and other machines, great difficulties were experienced from the beat, or concussion, which was generally attributed to the fall of the valve upon its seat, so that when the pump worked fast, or the pressure was materially augmented, serious casualties frequently occurred. At length the author, finding that increasing the passage for the escape of the water from the annular valves, limiting the rise and applying a spring to ensure their rapid closing, would not cure the evil, became convinced that it originated in other sources. Attention was then directed to the suction valve, as the concussion generally occurred at the instant of the beginning of the return stroke. The numerous anomalous results which appeared to envelop the cause in mystery were carefully investigated, and observation of several ingeniously devised experiments induced the conviction, that the cause of the blow would be found to be

connected with the rise of the delivery valve, which occurred simultaneously with the closing of the suction valve.

On examining the construction of the delivery valve, it was evident, that while its entire upper area was acted upon by the downward or closing pressure, only that portion of the under surface, which covered the annular opening, was acted upon by the upward or opening pressure. It was obvious, therefore, that since the area acted upon from below, was much less than that acted upon from above, a momentary excess of pressure must be produced, by the plunger in the pump barrel, in order to raise the valve from its seat. The material of the pump barrel would thus, for an instant, be unduly distended, and a sudden collapse would take place immediately on starting of the valve. In the case of a valve which was exhibited, the surface acted upon from below, was only one-sixth of the surface subjected to downward pressure, so that the pressure per square inch, exerted by the plunger in starting the valve, would be six times that of the column to be lifted.

All the effects observed agreed with this explanation, and, by way of experiment, a valve was constructed with the annular openings so extended as to diminish the bearing surfaces, and to lessen the difference between the areas of the upper and under surfaces. This construction proved, to some extent, successful, and it was perceived that a valve of a more ordinary kind would be less liable to concussion than one of the annular form; which latter was abandoned, and a single beat valve was adopted, in which the bearing surfaces were reduced as much as possible, so as to render the difference of areas inconsiderable—and the result of this radical change was, that a smooth and nearly noiseless action was obtained, even when the pump made one hundred strokes per minute. It appeared then, that in all cases where the pumps were to be worked rapidly under a heavy pressure, it was important that the delivery-valve should be so constructed as to yield with facility to the pressure of the plunger or piston, and to attain this object, the area of the valve, acted upon from beneath, must bear a large proportion to the area pressed upon from above.

It was admitted, that in many cases the concussion did arise from the fall of the valve, and that the violence of the shock was attributable to the valve remaining open until after the turn of the stroke, and then being suddenly forced down by the weight of the returning column. It was suggested that the causes of this action were the excessive rise of the valve, and the overrunning of the column in the rising or delivery pipe, consequent on the momentum imparted to it, by the previous stroke of the pump. The most efficacious remedies were found to be, large dimensions, so as to permit very free passage for the water, and very limited rise of the valve; and either increasing the diameter of the delivery pipe or applying means of keeping up a continuous motion of the column, without drawing tail-water through the valves. It was hoped that these observations would tend to the removal of an evil which at present imposed a limit to the speed at which pumps could be generally worked, and which involved the necessity for the use of larger machinery than would otherwise be requisite.

In the discussion which ensued, a modification of the annular valve was shown, in which the rings were arranged in an amphitheatral form, the outside larger rings being placed higher than the inside smaller rings, so as to give greater facility for obtaining a long steady guide in the centre; this form was adopted by Mr. C. Cowper in several large engines. It was shown that concussions were frequently caused by the return of the piston through a space upon a body of quiescent water, without any action of the valves. The form of the apertures for the passage of the water might, it was suggested, have some influence in producing the shock, by the velocity imparted to the column. It was explained, that the aperture in the valve was so much larger than the area of the inlet pipe, that its form could not have much influence.

In proof of the effect of the overshooting of a column of water, it was shown that even when water was allowed to rush violently forward, without any considerable pressure of head, a vacuum appeared to be formed and the pipes had been burst. It was stated, that although the use of vulcanized India-rubber had not been found to diminish the shock of the beat of valves, under heavy pressure, it had been very successfully applied to the air-pump buckets of marine steam-engines, and an instance was given of a set of valves of vulcanized India-rubber, 38 inches diameter, working 36 strokes per minute, upon a metal grating, the bars of which were one-eighth of an inch wide and the apertures five-eighths of an inch square, lasting in perfect order for upwards of twelve months. It was stated that the vulcanized India-rubber would bear, perfectly, almost any amount of compression for an indefinite period, but that on being subjected to repeated extension for a lengthened period, its elasticity became impaired; this, it was suggested, might arise partly from a portion of the sulphur, which was only held in mechanical

combination, being thrown off, and also from the substance absorbing heat in contraction and giving it out on distension, and thus producing "eremacausis," which eventually caused its disintegration.

It was shown that oil rendered tubes of the material fragile; and that the continued action of light and air upon any India-rubber fabric, sufficed to produce a change and render it brittle. It was shown also, that although gutta percha tubes, whilst under water, were very durable, yet that on exposure to the air for a few years unpainted, the substance laminated and could be rubbed to pieces. The gutta percha covering of the wires of the Submarine Telegraph was very durable under the sea, but on the face of the Dover cliff it had soon been destroyed; it was then buried under ground, and had proved perfectly successful. It was suggested that an interesting series of experiments could be made on the duration of elasticity of vulcanized India-rubber, as that substance, as well as gutta percha, appeared to be eminently adapted for use in engineering operations.

Sitting of April 19.

THE chair was taken by James Meadows Rendel, Esq., President; and the paper read was, "A Description of the Liverpool Corporation Waterworks," by Mr. T. Duncan, Assoc. Inst. C.E.

After some introductory remarks, on the extraordinary rapidity of the growth and extension of the town of Liverpool, and the consequent necessity for a better supply of water, the various ordinary sources of supply for towns were examined; and it was shown how, by degrees, the private wells required to be so deepened as that the expense became a burthen on the inhabitants, and companies were formed for the general and more comprehensive supply of water at a cheaper rate, for domestic and public service. Allusion was made to the extensive works now in course of construction, under the direction of Mr. Hawksley, for bringing by gravitation from Rivington Pike, a distance of twenty-four miles, such a supply of water as to supersede the employment of steam engines for pumping from the wells in the sandstone, whence the water used in Liverpool was almost entirely derived.

From a physical and geological description of the site of the town, its extent, on the right bank of the Mersey, was shown to be about four miles and a quarter in length, by a width varying from 200 yards to 2 miles; the ground rises gradually from the river, to an altitude of 250 feet, and the stratum is the lower new red sandstone, covered by a strong tenacious clay, sometimes as much as 26 feet in thickness. The rock dips from the river, at an inclination of one in six, and was full of water throughout its area, which was calculated to be about 100 square miles.

From a sketch of the history of the several water companies, it appeared that about the year 1694, permission was granted by the Corporation to a company to supply Liverpool with water, from the springs at Bootle. This grant was transferred to Sir Cleave Moore, Bart., in 1709. Subsequently a speculator commenced the construction of a culvert in masonry, but it was abandoned, and nothing further was done until the year 1799, when the Bootle Waterworks Company, with Mr. Telford as their engineer, and the Liverpool and Harrington Waterworks Company, with Mr. Thomas Simpson as their engineer, combined together for the general supply of the town.

Descriptions were then given of the first establishment and gradual increase of the Bootle works, from one inconsiderable reservoir, and a steam engine of two horses power, forcing water through wooden tubes; and the more rapid progress of the Harrington Company, up to the present time, when the former works consisted of a very extensive excavation in the rock, seventeen bore holes from 13 feet to 600 feet deep, delivering daily about 1,102,000 gallons, and three engines forcing this water into iron pipes. The duty performed by these engines varied between 15,000,000 and 21,000,000½ lbs., raised 1 foot high by 1 cwt. of coal. The latter (Harrington) works consisted of five stations, each with a steam engine pumping from a well, with lateral tunnels, and bore-holes, yielding various quantities of water, from 124,000 gallons to 819,000 gallons daily, and the engines doing a duty from 16,000,000 to 47,000,000 lbs. of water raised 1 foot high by 1 cwt. of coal. There were four reservoirs, chiefly roofed over, containing in the aggregate 1,871,176 gallons, at heights varying from 124 feet to 236 feet above the dock cill.

In the year 1840, a series of conflagrations commenced, causing such a destruction of property, and exhibiting so clearly the deficiency of the water supply, to meet contingencies of that nature, that a scheme was proposed by Mr. Capes Ashlin, the Treasurer to the Highway Board, for an independent supply of water for extinguishing fires, flushing sewers, and other services. The Green Lane works, under the direction of Mr. James Simpson, resulted from this proposal; they were commenced in 1841, and brought into operation in

1847. The supply of water was obtained from a well 185 feet deep, the bottom being 41 feet below the dock cill; extensive tunnels were driven in various directions whence the water flowed; the maximum yield being about 850 gallons per minute. The cost of this well was 6,600*l*. The water was raised by a steam engine, working drawing and plunger-pumps, to lift over a stand-pipe 111 feet in height. The duty was about 49,831,672 lbs.

In connection with this engine was a reservoir, storing 8,000,000 gallons, at an elevation of 223 feet above the dock cill. The growth of "confervæ" in the open reservoir was found to be so rapid, and so detrimental to the purity of the water, that works were in execution for covering this reservoir, and similar constructions were in progress for extending the storage to 21,000,000 gallons, protected from the light. From all the works which had been mentioned, cast-iron mains, varying in diameter from 18 inches downwards, branched into the streets; in one case being protected in a tunnel, the lower part forming a duct for the overflow, and for the water for flushing the boundary sewer, as well as for conveying away the contents of the reservoirs when they were emptied.

The Highway Board being restricted to the expenditure of a sum inadequate to the completion of the entire scheme, the chief works were confined to the neighbourhood of the docks, where the most inflammable merchandize was stored, and where fires most frequently occurred. A main of pipes was carried along, and branches laid with fire-plugs, in clusters (generally of three) at convenient spots, each controlled by a separate valve. The general system of fire service (which was described) appeared to be very perfect; for in a tabular statement, it was shown, that in 1842 there occurred 140 fires, in which property was destroyed to the amount of 517,927*l*.,—and gradually decreasing until, in 1852, in 132 fires, the value of property destroyed only amounted to 15,880*l*.

The hydrants for watering the streets, and which served also for fire-plugs, were formerly of very rude construction; an improved form had been adopted, and the water-carts were each filled in about one minute, so that one cart could distribute about fifty loads per day. Branches were taken off the mains by easy bends, with a valve to each, whence the pipe curved gradually, and entered near the bottom of the sewer, in a line with the current. The general constitution of that portion of the police-force specially devoted to the fire-brigade, was then described. It consisted of about eighty men and one superintendent. These men, and the police generally, were instructed as to the situations of the fire-plugs and pipes, and how to bring water most rapidly to bear upon a fire; the town was arranged in districts, the fire-police had their undivided attention fixed on their several duties, and the best results had been obtained. Uniformity in all the appliances was strongly insisted on, and everything had been supplied to an uniform standard.

In 1846-7 the Corporation obtained a Bill authorising the purchase of the existing water-works, and for the transfer of the powers of the Highway Board; this was completed under the arbitration of Mr. Robert Stephenson, at the price of 622,000*l*.; and since January, 1848, the combined system came into force, and the first attempt was to amalgamate the different works; but it had been a matter of difficulty to give the public the full benefit. Previous to the amalgamation of the works, one company pretended to give a daily supply, whilst the other only laid on the water three times in each week. Daily supply was now attempted, and a constant service was projected, when the water from Rivington should arrive in the town; the fire-service would also be extended at that time.

The mains and branches having been laid by separate companies, were of course placed without any regard to regularity, or any view to combination; it had, therefore, been very difficult to arrange any definite system; no correct plans of the old works existed; the pipes had been so broken, patched, and plugged, that the water-way was nearly stopped, and they had, in many cases, sunk so much, that no general level was maintained; great difficulties arose in the attempt to systematize the service, and it became necessary to divide the town into sections, which could be worked separately, or conjointly. The diameter of the lead service-pipes was reduced generally to $\frac{5}{8}$ths of an inch; wooden plugs were forbidden; a better kind of ferule was employed; the weights of the various pipes were regulated by a scale, and adapted to a contour line; meters had been introduced with great advantage both to the company and the consumer; an intermittent supply was not, however, considered so favourable to their use as a constant supply; the meters principally used were made by Mr. Parkinson, of London; they were rented of the Corporation by the consumers, and ranged in capacity from 200 to 1,200 gallons per hour.

The supply of water for the shipping was a matter of importance, and was now well arranged by means of hydrants and hose, the latter extending on board the vessel. Formerly much water was wasted,

and the goods around were injured; now a cask containing 120 gallons could be filled in two minutes without any waste. After trying all sorts of hose, the preference was given to the copper-riveted leather hose, 2½ inches in diameter.

The extension of the works at Green-lane in 1850, and completed in 1852, consisted of a steam-engine, working into the original well by the side shaft; the duty was 57,800,000lbs. by 1 cwt. of coal. Gutta percha seatings had been used in the valves and were found to answer well. A mixture of black lead and gutta percha had also been found to succeed for pump buckets. Tabular forms were given of the cost of pumping the water for the town supply, whence it appeared that the average cost per million gallons was,

	£	s.	d
In 1850	4	12	3¼
„ 1851	3	4	9
„ 1852	2	18	2¾

The prices of Wigan coals being at Bootle, 6*s*. 10*d*., and slack, 3*s*. 8*d*. per ton, giving an average of 6*s*. 6*d*. per ton for the mixture, and at the other stations about 6*s*. per ton for the mixture.

Another bore-hole was also put down at Green-lane, which had proved most successful, and yielded 1,115,474 gallons per day, in addition to the former produce of the well, without any indication of diminishing the produce of the other wells. It was probable, that, from the broken and dislocated nature of the strata, the position of the Green-lane well was exactly where it would intercept the infiltration of the remote parts of the formation, and thus the large yield of the bore-hole was accounted for.

A tabular statement of the rain-fall in Liverpool for 1850, 1851, and 1852, gave a depth of fall—

In 1850	21·460 inches.
„ 1851	26·280 „
„ 1852	32·202 „

The maximum daily yield of the public wells, situated within an area of eight million superficial yards, was six million gallons, or three-quarters of a gallon per day per superficial yard; or equal to a depth of 4 feet 10 inches per annum over the whole area.

A comparison was then drawn between the intermittent and constant supply systems; after stating that the quantity of water delivered in three years was—

1850	1,582,492,693 galls.
1851	1,644,035,502 „
1852	1,850,783,362 „

it was shown, that the constant supply, when tried for a short time, had approached so nearly to the entire yield of the wells, as to enforce recurrence to the intermittent system until the anticipated larger supply was received.

It was natural that there should be a considerable waste of water on first giving to the public an unlimited supply, especially when the arrangements had been originally intended for the intermittent system; but it was a question, whether, in the end, one system would not be found as economical as the other; and there could be no comparison between their relative merits.

Some excellent observations were given of the flow of water through pipes; and the paper concluded with an analysis of the water, and a statement that when the entire arrangements were completed, a million of inhabitants could be fully supplied at Liverpool with water of the best quality.

The following Paper was announced to be read at the meeting of Tuesday, April 26th, "Observations on Salt Water, and its Application to the Generation of Steam," by Mr. J. B. Huntington, Assoc. Inst. C.E.

An Introductory Treatise on Mensuration, in Theory and Practice. By J. R. Young, late professor of Mathematics in the Royal Academical Institution, Belfast. Charles Mozley.

This is a comprehensive work on a subject which is now increasing rapidly in its importance in a great variety of mechanical and manufacturing operations, and which the learned author is eminently qualified to present to the public in the form most convenient for practice. The study of mensuration is one which almost every one should know something about, as there are few indeed who have not occasion, at one time or another, to employ its rules, if not for business purposes, at least in the concerns of domestic life. To insist upon its importance as a matter of education is quite needless. The value of the acquisition of it is undoubtedly great; and were it a more difficult subject to master than it really is, it would be worthy of a great amount of labour bestowed upon it. The reader who will apply himself to the compendious treatise before us, will find himself speedily in the intellectual possession of all the great rules, and ready to apply them in practice. If he be acquainted with the admirable character of the author's

works for self-study,—if he have observed how many difficulties are smoothed by a little lucid explanation beyond that which is given in the ordinary run of class-books, he will take up this "Mensuration" with the certainty that its study will shortly crown with success the slightest exertion of his own to comprehend it. If he be not, we know of no other of this author's numerous works which could better serve as an illustration. At once comprehensive, perspicuous, and clear, and abundantly illustrated with examples and figures, it is exactly the book for the student and the man of practice.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING APRIL 21, 1853.

ALEXANDER SHAIRP, of the Patent-office, 166, Fleet-street, London. *For an improved cutting and slicing-machine.* (A communication.) Patent dated October 7, 1852.

The main feature of the improved machinery which forms the subject of this patent consists in the employment of discoidal cutters mounted at intervals upon a revolving shaft, and whose edges run in grooves in a cylinder placed parallel to that shaft, the division of the straw or vegetables to be cut or sliced being effected by bringing the same lengthwise between the cutter and cylinder as they revolve together, by which means the straw, &c., is cut into a number of pieces equal to that of the cutters.

Any convenient number of cutters may be employed, and they are mounted on the shaft with washers between them, the thickness of which determines the fineness to which the straw, &c., is to be cut. Between the grooves on the cylinder, in which the edges of the cutters work, are hooked teeth, which are disposed in rows around the periphery of the cylinders, for the purpose of seizing the straw and carrying it round between the cutters and the grooves. The straw is prevented from clogging the machine by means of a rake, a prong of which comes nearly in contact with each of the washers between the cutters and thus keeps the spaces clear, and the grooves of the cylinder are kept cleared out by a similar arrangement. A roller is suspended loosely in guides over the feed-trough, for the purpose of pressing upon the straw and keeping it from flying up as it approaches the cutters. The feed-trough is inclined sufficiently to cause the straw to slide down it to the cutters, and should be of sufficient width to allow a bundle to lie across it.

All kinds of vegetables may be cut up by this machine for feed for cattle in fine or coarse slices, according to the number of cutters employed and their distance apart on the cutter-shaft.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co., of 166, Fleet-street, London, patent agents. *For improvements in knitting-machinery.* (A communication.) Patent dated October 7, 1852.

PROVISIONAL PROTECTIONS.

Dated March 26, 1853.

726. Robert Hazard. A podombroslontron, or an improved apparatus for either sponge or shower-bath, and all lavatory purposes.

Dated March 31, 1853.

771. Joseph Rylands. Improvements in yards and spars of ships and other vessels.

773. George Hanson and David Chadwick. Improvements in apparatus for measuring gas, water, and other fluids, which improvements are also applicable for obtaining motive power.

Dated April 1, 1853.

775. George Fergusson Wilson and James Freeman Lee. Improvements in the manufacture of night-lights and their cases.

776. George Fergusson Wilson. Improvements in treating certain oily matters, and in the manufacture of oil.

777. Bartholomew Brittain. Improvements in the means of supporting or retaining bedsteads or other articles of furniture in their proper positions.

779. William Crofts. Improvements in weaving.

780. Jonathan Saunders. Improvements in the manufacture of railway tyres.

781. Henry Spencer, Henry Tattersall, and Hugh Simpheon. Certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous materials.

782. Robert Evans Peterson. An improved piston. A communication.

783. George Fergusson Wilson. Improvements in the manufacture of cloths and in the preparation of wool.

784. George Fergusson Wilson. Improvements in treating certain greasy matters, and in the manufacture of candles.

785. George Fergusson Wilson. Improvements in the manufacture of night-lights, and in apparatus to be used therewith.

Dated April 2, 1853.

787. George Holcroft and William Jennings Hoyle. Certain improvements in steam-engines.

788. George Robb. Improvements in the manufacture of sulphuric acid, alkalis, and other salts.

789. Nicolas Ferdinand Barthelemy. Improvements in apparatus for sharpening razors.

790. Albion Richard Snelling. An improved emigrants' habitation cart.

791. Christopher Garman Rosenkilde. Improvements in window-sash fastenings.

792. Frederick William Mowbray. Improvements in doubling wool and other fibrous substances.

Dated April 4, 1853.

793. William Edward Newton. Improvements in engines to be worked by air or gases. A communication.

794. James Findlow. Improvements in beds or couches for sick persons.
795. Joseph Palin. Improvements in apparatus applicable to evaporation and distillation.
796. William Edward Newton. Improvements in producing plates or surfaces, which may be used as printing or embossing surfaces, or as door-plates, dial, or number-plates, or other plates or surfaces bearing inscriptions or devices of various kinds. A communication.
797. William Beckett Johnson. Improvements in steam-engines, and in apparatus connected therewith.
798. Robert William Siever and James Crosby, Improvements applicable to looms for the manufacture of textile fabrics.
799. Jesse Ross and Thomas Robert Hafford Ross. Certain improvements in machinery or apparatus for combing wool, cotton, silk, flax, and other suitable fibrous materials.
800. George Henry Brockbank. Improvements in horizontal pianofortes.
801. William Walker. Improvements in drying malt.
802. Moses Poole. Improvements in winding silk from the cocoon. A communication.
803. Francis Steigewald. Improvements in the manufacture of glass and porcelain.
804. Charles May. Improvements in machinery for manufacturing and rolling iron.
805. Francis Steigewald. Improvements in heating furnaces.
806. Antoine Burq. Certain instruments, apparatus, and articles, for the application of electro-galvanic and magnetic action for medical purposes.
807. John Lawson. Improvements in the suspension and management of ships' boats.
808. Alfred Vincent Newton. An improved construction of self-inking stamping apparatus. A communication.

Dated April 5, 1853.

810. William Mavity. A new or improved method of manufacturing letters and figures to be used as printing-type, lettering for sign and window-boards, and other such like purposes.
812. George Purcell. A new method of adjustment in the art of printing by means of certain combinations of various-sized spaces and quadrats.
814. James Long. An improved method of setting up and adjusting ships' rigging of all tonnage.
816. Joseph Haley. Improvements in machinery or apparatus for forging, stamping, and cutting iron or other substances, which machinery or apparatus is commonly called a "steam-hammer."
818. William Johnson. Improvements in weaving, and in the machinery employed therein. A communication.
820. John Thomas. Improvements in apparatus for the manufacture of gas and coke.

Dated April 6, 1853.

822. Edward Simons. Improvements in telegraphing or communicating signals.
824. James Jerram Pratt. Certain improvements in stockings.
826. Henry Alfred Jowett. Improvements in apparatus for heating, which improvements are particularly applicable for generating steam, or evaporating solutions, and may be applied for heating purposes generally.
828. William Johnson. Improvements in the production of ornamental surfaces in glass, porcelain, metals, and similar materials. A communication.
830. Samuel Denison and Henry Dean Denison. Improvements in rating, breaking, and scutching flax, hemp, and other fibrous matters.

Dated April 7, 1853.

832. William Augustus Pascal Aymard. Certain improvements in the preparation for and application to the manufacture of candles, and other purposes, of certain fatty and resinous bodies or substances. A communication.
834. John Grist. Improvements in machinery for the manufacture of casks, barrels, and other similar vessels.
836. William Henry Wells, Edward Mann, and John Harman. Improvements in grinding wheat and other grain.
838. Colin Mather. Improvements in power looms.
840. Frederick Le Mesurier. Improvements in apparatus for measuring and indicating a given period of time.
842. Christopher Nickels. Improvements in machinery for masticating, kneading, or grinding India-rubber, gutta percha, and other matters.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 15*th*, 1853.)

703. Auguste Baboneau. An improved apparatus for melting and mixing asphalt with bitumen and other substances.
819. James Roose. Improvements in the manufacture of welded iron tubes.
841. Peter Armand Lecomte de Fontainemoreau. Improvements in machinery for manufacturing fishing and other nets. A communication.
846. Joseph Henri Combres. Preventing the ill effects of dampness on walls and dwellings. A communication.
848. Charles Finlayson. Improvements in apparatus for heating, drying, and ventilating.
858. John Tatham and David Cheetham. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous substances.

(*From the "London Gazette," April* 19*th*, 1853.)

727. John Henry Johnson. Improvements in measuring and registering the flow of fluids. A communication.
849. Achille Jean Louis Hypolite Tourteau, Comte de Septeuil. Improvements in the construction of electro-magnetic engines and in batteries.
924. William Slater. Improvements in ovens and apparatus for baking.
974. Edward Tucker. Improvements in the manufacture or production of starch.
983. John Henry Johnson. Improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein. A communication.
989. Richard Archibald Brooman. Improvements in safety valves. A communication.
990. Richard Archibald Brooman. Improvements in machinery or apparatus for heating, evaporating, torrefying, distilling, and refrigerating. A communication.
997. William Baddeley. Improvements in apparatus for the conversion of rectilinear into circular motion. A communication.
1020. Richard Archibald Brooman. Improvements in evaporating-apparatus. A communication.
1027. William Sorrell. Improvements in furnaces and fireplaces for consuming smoke.
1061. Philippe D'homme. Certain improve-

ments in the manufacture of window-blinds, curtains, and hangings. A communication.

1145. William Westley. An improved fastener, applicable to the fastening of window-sashes, tables, and other similar purposes.

1154. John Lowther Murphy. An improvement in drawing off liquids from barrels and other vessels.

1194. James Edgar Cook. An improved composition for the prevention of the decay and fouling of ships' ibottoms and other exposed surfaces.

1199. Thomas Walker. Improvements in apparatus for regulating the speed of steam engines.

1200. Thomas Walker. Improvements in apparatus for regulating the dampers of steam boiler and other evaporating furnaces, which apparatus is also applicable for indicating the pressure of steam or other fluids.

1207. Thomas Harrison. Improvements in steam engines.

82. John Arrowsmith. New or improved machinery for shaping metals.

109. John Arrowsmith. Certain new or improved pumping machinery.

151. Abraham Anton Meijsenheijm Knipschaar. An illuminated night clock.

418. Thomas Clark Ogden. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

575. Augustino Carosio. A hydrodynamic battery, or new or improved electro-magnetic apparatus, which, with its products, are applicable to the production of motive power, of light, and of heat.

582. Nicolas Schmitt. Improvements in cleansing and separating ores and coal.

596. François Valtat and François Marie Rouillé. Improvements in the construction of the combs of looms for weaving.

626. Thomas Evans the younger. Certain improvements in the construction of steam boilers.

702. Nicholas G. Norcross. Certain improvements in machinery for planing or reducing boards or timber.

121. William McNaught. Certain improvements in steam engines.

735. David Stephens Brown. Certain improvements in engines to be worked by steam, or any other elastic fluid, which invention also includes the apparatus for generating such steam or other elastic fluid.

737. Thomas James Perry. Improvements in printing.

741. George Edward Dering. Improvements in the manufacture of certain salts and oxides of metals.

771. Joseph Rylands. Improvements in yards and spars of ships and other vessels.

775. George Fergusson Wilson. Improvements in the manufacture of night-lights and their cases.

776. George Fergusson Wilson. Improvements in treating certain oily matters, and in the manufacture of oil.

779. William Crofts. Improvements in weaving.

783. George Fergusson Wilson. Improvements in the manufacture of cloths, and in the preparation of wool.

784. George Fergusson Wilson. Improvements in treating certain greasy matters, and in the manufacture of candles.

785. George Fergusson Wilson. Improvements in the manufacture of night lights, and in apparatus to be used therewith.

792. Frederick William Mowbray. Improvements in doubling wool and other fibrous substances.

799. Jesse Ross and Thomas Robert Hafford Ross. Certain improvements in machinery or apparatus for combing wool, cotton, silk, flax, and other suitable fibrous materials.

800. George Henry Brockbank. Improvements in horizontal pianofortes.

804. Charles May. Improvements in machinery for manufacturing and rolling iron.

816. Joseph Haley. Improvements in machinery or apparatus for forging, stamping, and cutting iron or other substances, which machinery or apparatus is commonly called a "steam hammer."

818. William Johnson. Improvements in weaving, and in the machinery employed therein. A communication.

836. William Henry Wells, Edward Mann, and John Harman. Improvements in grinding wheat, and other grain.

840. Frederick Le Mesurier. Improvements in apparatus for measuring and indicating a given period of time.

842. Christopher Nickels. Improvements in machinery for masticating, kneading, or grinding India-rubber, gutta percha, and other matters.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 14, 1853.

1852:

405. Allan Edwin Hewson.

Sealed April 16, 1853.

421. Charles Reeves, junior.
422. George Randfield Tovell.
429. William Harcourt and Joseph Harcourt.
436. Robert Mole and Robert Mole, jun.
444. Gabriel Benda.
454. Charles Clark and John Gilbert.
462. Jacob Tilton Slade.
470. William Lukyn.
473. Julian Bernard.
486. Julian Boilesve.
495. David Crichton.
504. George Kennedy Geyelin.
547. James Henry Smith.

1853:

302. William Brown.
305. Philip Webley.
375. George Lee Lysnar.
395. Alphonse Rene le Mire de Normandy.
406. Edouard Sy.
422. Isaac Frost.
428. Henry Noad.
446. Benjamin Barton.
448. John Davies Morries Stirling.

450. James Hudson and Thomas Bamford Hudson.
464. William Spence.

Sealed April 19, 1853.

1852:
439. Martin Walter O'Byrne and John Dowling.
445. George Gotch.
449. John Jones.

Sealed April 20, 1853.

461. Thomas Henry Biddles and John William Duphrate.
535. James Conry.
607. Francis Daniells.
631. Harrison Blair.
728. George Stenson.
730. George Philcot.
731. Edward Davy.
743. Peter Forbes.
780. James Potter.
811. Benjamin Walker and William Bestwick.
949. John Bethell.
986. James Norton.
1082. Archibald Slate.
1083. Archibald Slate.
1084. Archibald Slate.
1085. James Dunlop.
1090. Archibald Slate.
1091. Archibald Slate.
1146. William Henry Fox Talbot.

1853:
161. Louis Jules Joseph Malegue.
243. David Stephen Brown.
379. William Edward Newton.
415. Matthias Walker.
429. Nathan Dutton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
April 15	3447	G. Simons	Birmingham	Writing-case and taper-stand.
,,	3448	Simcox, Pemberton, & Sons	Birmingham	Picture-suspending apparatus.
,,	3449	J. Harper	Cambridge	Stay-fastening.
16	3450	J. Lee and Co.	Birmingham	Crowbar.
,,	3451	W. G. Davies	Bideford	Ladies' supporter.
19	3452	T. Young	Poplar	Emigrants' companion.
,,	3453	W. Pope and Son	Edgeware-road	Chimney valve-seat.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

April 16	501	E. Maw	Seacombe	Metal plate-clip.
,,	502	W. Baddeley	Islington	Oar.
,,	503	J. E. Boyd	Lewisham	Hat-cone.

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Mechanics' Magazine.

No. 1551.] SATURDAY, APRIL 30, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

LEWTHWAITE'S PATENT NUMBERING AND MARKING-MACHINE.

Fig. 1.

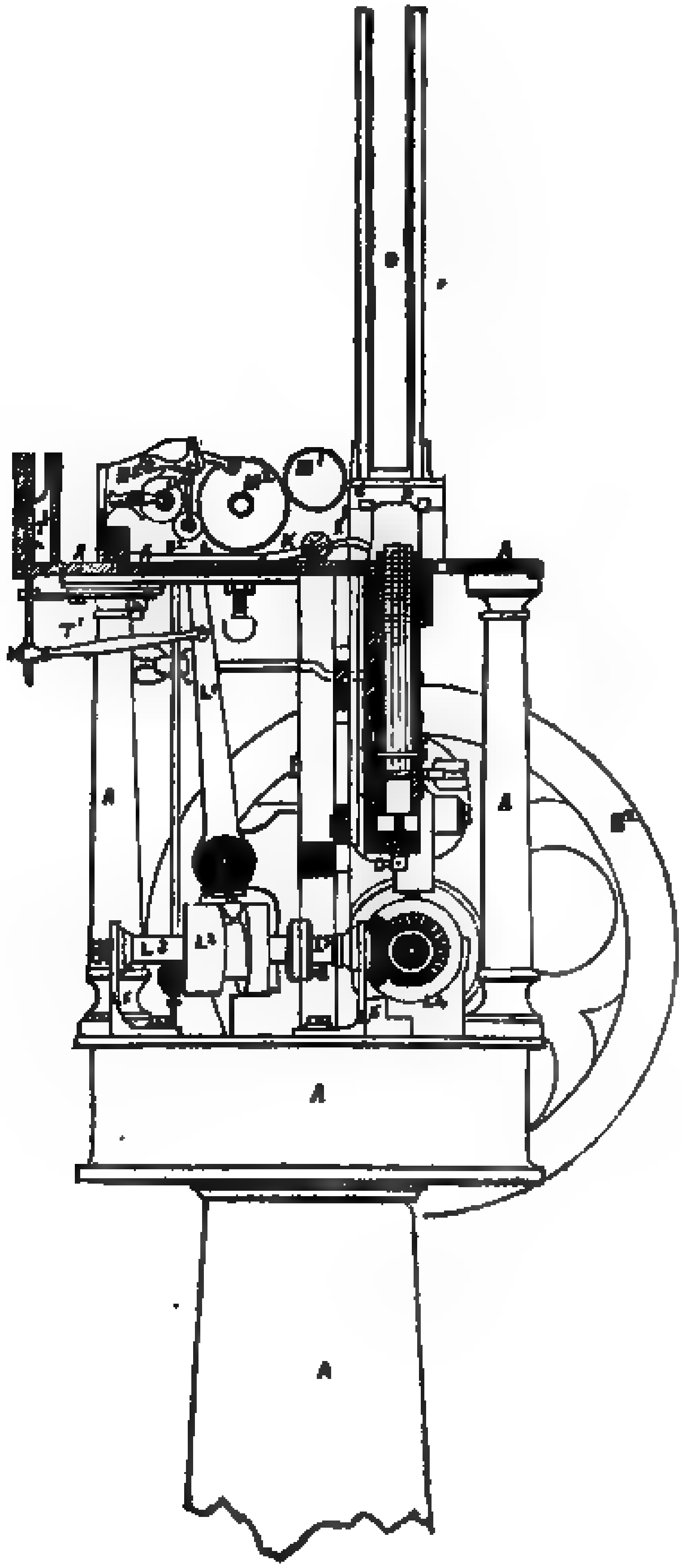
LEWTHWAITE'S PATENT NUMBERING AND MARKING-MACHINE.

(Patent dated October 8, 1852.)

Mr. Lewthwaite's patent describes a variety of new operations connected with the manufacture and manipulation of card, including a method of preparing a description of that article possessing a superior surface for being printed upon; a machine for cutting it into tickets, and delivering them when cut into separate compartments; and another machine for marking and numbering them in succession. This last portion of the patent we propose to bring under the notice of our readers, as it promises to have an extensive application to the important object of numbering and printing, and marking with inks of different colours, the tickets issued to railway travellers, which, for various purposes incidental to extensive traffic, require to be distinguished in different ways. The machine represented in the accompanying figures performs this work with perfect precision, and a rapidity more than sufficient for the most pressing urgency that can arise in practice. When impelled by steam power, it is estimated to be capable of printing and numbering 20,000 tickets per hour, though it could never be necessary to drive it at that rate. The basis of the invention is to be found in a previous patent of Mr. Lewthwaite's, obtained in July, 1847, the improvements introduced into which consist in enabling railway tickets to be printed and numbered consecutively, and check-marked with any distinguishing device, at *one continuous* operation; for this purpose, the machine combines printing and marking apparatus with the numbering wheels, and supplies them with ink from inking-rollers provided with means for distributing the ink evenly on their surfaces, and arranged so that the printing, numbering, and marking may be performed in different colours, and the colours transposed and interchanged at will. The machine is also contrived in such a manner that it shall stop working, and strike a bell, when a given number of tickets shall have been printed, numbered, and marked, that in the interval the exact amount of work performed may be readily ascertained, and that it shall stop working, and give a similar notice in the event of the printed cards not being regularly delivered in consequence of the introduction of imperfect cards or any other casualty.

Fig. 1 is a front elevation, and fig. 2 a vertical section of the machine. A A is the general framework, which consists of a bed-plate and upper table supported on it by four pillars at the corners. B is the main shaft, from which the several parts of the machine derive their motion, and which turns in the end bearings, B^1 B^1. It is furnished at one end with a fly-wheel, B^2, having a handle by which the machine may be worked by hand, and at the other end with a clutch, B^3, to which is coupled the driving-pulley, B^4, when the machine is to be driven by power. The pulley, B^4, is connected also with an alarum arrangement for giving the required notice, as will be presently explained. C is a supply-tube, partially open at the sides, as shown in fig. 2, and of a section equal to the ticket for which the machine is arranged. In this open tube the tickets are placed, the lowermost of them resting on ledges at the bottom. A lever, C^2, having its fulcrum at C^3 in the standard F, is attached at the upper end to a slide, which traverses horizontally at the bottom of the tube, C, while the lower end is furnished with a friction-roller, C^4, which runs in the cam-groove of the pulley, C^5. This groove is so formed as to cause the slide to make a forward and backward movement for each revolution of the shaft, B. The slide, worked by the motion of the upper end of the lever, has a projection formed across its upper surface, in a direction perpendicular to that of the shaft, and equal to the thickness of the card. By coming in contact with the hinder edge of the lowermost ticket in the tube, this projection pushes it forward along the ledges on which it rested, and the lever, having completed its stroke, immediately retires to repeat its action on the ticket which is now lowest in the tube. This last ticket being pushed forward by the slide, will itself advance the one first described another step, and thus bring it under the action of the numbering-wheels and check-marking apparatus. D is a moveable plate, furnished with pivots, by means of which it may be easily removed when required. This plate occupies a position immediately over the printing, numbering, and marking arrangements, and is furnished on its under side (as shown in the detached and inverted view, fig. 3) with a groove and ledges coinciding accurately with those in the metal plate, C^1, which form continuations of those at the bottom of the hopper, C. By means of this arrangement, the tickets may be moved forward in the grooves without the possibility of obstruction. The back of the groove in the plate, D, is lined with thin sheet vulcanized India-rubber, against which the tickets rest whilst being printed; the object being to provide an elastic bed for the purpose. The

Fig. 2.



ledges on which the tickets are supported whilst passing through the groove in the plate, D, are capable of being adjusted to suit different thicknesses of card, and springs are inserted at one side of the groove to make the tickets bear against the other, and thus prevent their slipping, which would vitiate the accurate registering of the printing and numbering on their surfaces. The plate, D, is held in its position when the machine is at work by the bridge-piece and screw, D^1, the ends of the bridge-piece coming under the catches, D^2, and the screw bearing against the back of the plate. E is a second open tube or hopper, into which the tickets are successively delivered after having undergone the operations of printing, numbering, and marking. This hopper communicates with the groove in the plate, D, by means of the plate, E^1, in which a similar groove and ledges are formed, accurately corresponding with those in the plate, D. The hopper, E, is provided with spring-ledges, on which the tickets are supported after having been raised by a plunger which receives them as they come from the plate, D, and which is worked by the tappet, E^3, on the shaft, B, and which passes through the guide, E^4, attached to the standard, F.

G is a slide which carries the holders for the printing and marking types, and the numbering-wheels. It works vertically in guides in the standard, F, being elevated by the continuous action of the machine to print the tickets, and lowered to a position sufficiently low to allow the types and numbering-wheels to receive a fresh supply of ink. This vertical movement is effected by the tappet, G^1, and cam-wheel, G^2, which is formed with a groove in its side to receive the pin, G^3, attached to the lower part of the slide. The two numbering-wheels, H H, consist each of four cogged discs mounted on axes in the holder, the cogs, ten in number, having on their extreme surfaces the cardinal numbers from 0 to 9, both inclusive, in their natural order of succession. They are arranged and geared in a manner well understood, and receive motion during the descent of the slide, G, after having given an impression by means of the pawls or clicks, G^4, so as to cause the change to the succeeding number to be effected before the inking-rollers come forward to deliver ink to their surfaces. The pawls, G^4, are capable of moving on their points of support, and are attached to the standard, F, in such a position as to fall forward into the spaces between the cogs of the discs when the slide, G, is raised. The check-marking, which may be of any particular kind determined upon, is effected by means of the moveable block, I, which occupies a position between the numbering-wheels, and is fitted to a groove in the metal between the wheels, in which position it is retained by a screw, though still capable of removal, when it is desired to change the check-mark. The numbering-wheels are shown in the drawings as arranged for printing railway return-tickets, each end of which is required to bear the same number, and the check-mark comes between the two numbers. When required to print single-journey tickets, one set of numbering discs only would be employed. The printing is performed by the type arranged for any particular words in the type-holder, J, which is provided with screws for retaining the type in position, and is also capable of adjustment vertically in the slide, G.

K^1, K^2, K^3, are the inking-rollers which supply the printing and numbering arrangements with ink. They are carried by a frame, L, which slides along the surface of the upper table of the machine when actuated by the lever, L^1, the upper end of which is jointed to the frame, L, passing through a slot in the table for the purpose. The lower end of the lever, L^1, is furnished with a friction-roller, which runs in the cam-groove formed in the pulley, L^2, mounted on the transverse shaft, L^3, which receives motion from the shaft, B, by means of the bevil-gearing, L^4, the ends of this shaft being supported in the bearings, L^5 L^5. The whole of this motion is shown in fig. 2.

The inking-rollers are suspended on axes fixed in arms attached to the front of the frame, L, connected at the back by bars, and pierced with several holes for the purpose of allowing the rollers to be shifted so as to come in contact with the front distributing-roller, M^1, when the colours are required to be transposed. The inking-rollers are subjected to a constant pressure by the action of coiled springs and screws, by which any of the frames can be held down and prevented from rising. During the back traverse of the frame, L, the bars connecting the arms which carry the inking-rollers come in contact with inclined planes, which raise the inking-rollers against the distributing-rollers, M^1 M^2. The arms are prolonged in front, and these prolongations, during the forward movement of the frame, come against another inclined plane on the under side plate, D, which prevents the inking-rollers from sticking to the distributing-rollers when the ink is thick; the prolongations acting in aid of the coiled springs which press upon them. The quantity of vertical motion which can thus be given to the inking-rollers may be regulated by means of screws placed underneath the inclined planes, and their pressure against the distributing-rollers adjusted at pleasure by increasing or diminishing the elevation of the inclined planes. A trough placed with a roller in it working against the

Fig. 5.

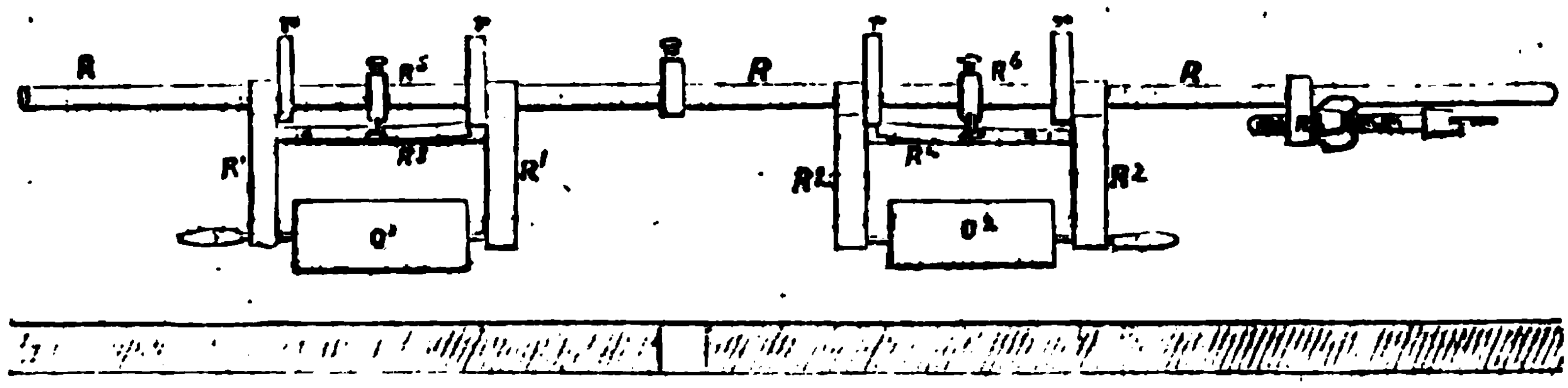


Fig. 4.

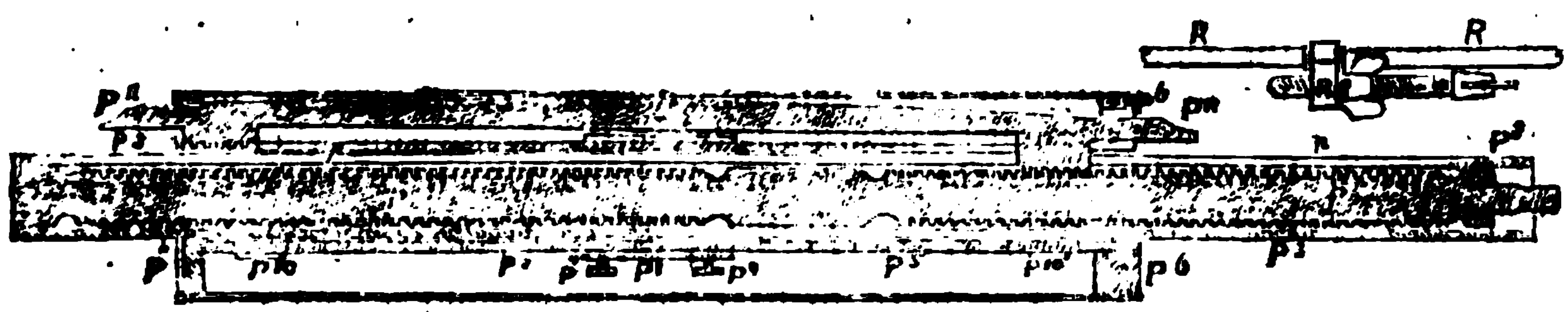
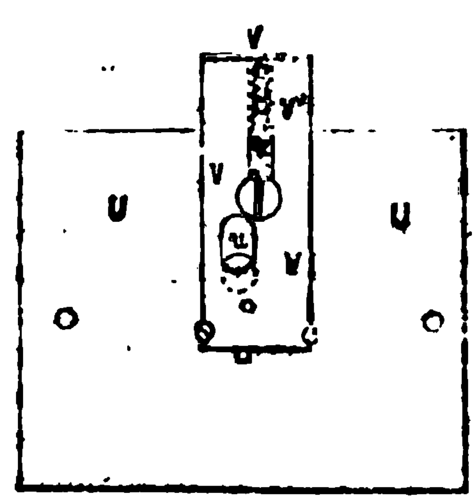


Fig. 6.



surface of the distributing-roller, M^1, serves as a supply for it. The roller, M^2, which serves to supply ink to the inking-rollers, K^1 and K^2, receives its supply from the ink reservoirs, N^1 N^2, at the back of the machine by means of the serving-rollers, O^1 O^2, and is caused to have a traversing motion longitudinally, in order that the ink may be uniformly spread over its surface, by means of the following arrangements:

A longitudinal section of the roller, M^2, with the traversing movement, is given separately in fig. 4. P is a rod or spindle, which is fixed immoveably in end bearings, and is screw-threaded, a right-hand screw being cut throughout one-half of its length, and a left-hand screw on the other half. P^3 is a tube which encloses this rod, and is also supported in the same bearings as the rod, P. A slot, *p*, is formed in it, and it is furnished at one end with a cord-wheel, P^4, fig. 1, by which it is driven from the shaft, B, on which a corresponding cord-wheel, P, is fixed. P^5 is a tube fixed in the centre of the roller, M^2, and exterior to tube, P^3, by means of the end discs, P^6, of the roller. A lever, P^7, centred at *q*, in the strap, P^8, which is secured around the tube, P^5, by the screws, P^9, and the ends of this lever have screw-cogs cut on them which take into the threads of the screw on the spindle, P, through the slot, *p*, in the tube P^3, so that when either end of the lever is in gear with the screwed spindle, and the roller, M^2, with its appendages, is set in motion, it will traverse in one or other direction at the same time that it revolves. The ends of the lever are prevented from becoming disengaged from the screw-threads by means of the springs, P^{10}. When the roller, M^2, has traversed in either direction as far as practicable, the end of the lever, P^7, in gear with the screw-threads is disengaged by its being brought into contact with an inclined stop, of which there is one placed at either end, the lever having projecting portions, P^{11}, to receive the pressure.

Motion is given to the front distributing-roller, M^1, by means of a spur-wheel, Q^1, on the axis of the roller, M^2, which gears into another spur-wheel on the axis of the roller, M^1. This roller is also caused to receive a traversing motion in the same direction as the roller, M^2, by means of a collar on this latter, which runs in a groove formed on the end of the roller, M^1. The roller, M^1, is fitted loosely on its axis, in which is formed a groove to receive a projecting stud on the interior of the roller. The traversing motion of the roller, M^2, is caused also to act on the serving-rollers, O^1 O^2, so as alternately to withdraw them from contact with the distributing-roller, M^2, and to prevent the accumulation of ink on its ends. This action is effected by means of the rod, R, fig. 5, which slides in the bearings, *r, r, r, r*, but is maintained in its proper position by coiled springs between the centre bearings. The figure represents a front elevation of the rod, R, and of the parts in connection with it, detached from the machine. O^1 O^2 are the serving-rollers, which have their axes supported in bearings in the frames, R^1 R^2, suspended from the rod, R. R^3 R^4 are springs attached to the upper bar of the frames, R^1 R^2, and R^5 R^6 are adjustable arms projecting from the rod, R, which come in contact with the springs, R^3 R^4, when the rod, R, is moved endwise by the action of the end plates of the distributing-roller, M^2, against set screws in two arms attached to the rod, R, of which R^8 is one. The action of the arms, R^5 R^6, against the springs, R^3 R^4, causes the frames carrying the serving-rollers, O^1 O^2, to be alternately moved away from the distributing-roller, M^2, into contact with two other rollers, of which O^4, fig. 2, is one, and from which they take up a fresh supply of ink, ready for being again brought into contact with the roller, M^2, when its motion is reversed. The rollers, O^4, are both mounted on the same spindle, O^5, which has its bearings in arms projecting from the back of the ink-troughs. These arms have adjusting nuts at the back, by which the rollers, O^4, can be brought closer to or removed further from the front of the troughs. The rollers, O^4, receive an intermittent motion, by which fresh portions of their surface are always presented to the rollers, O^1 O^2, when the latter are brought in contact with them, as before described, whereby a regular supply of ink is ensured.

The index is actuated by the link, T^1, fig. 2, from the lever, L^1: one end of the link, T^1, is jointed to the lever, L^1, and the opposite end is connected to the tail of the lever, T^2, from which motion is communicated to the ratchet-wheels of the index, in the same manner as in the index arrangements of counting-apparatus. The axis of the hands is carried through the back plate of the index, and furnished with a milled thumb-piece, by which the hands can be set at any given point. The index being arranged to stop the machine when the full number which it is capable of exhibiting is completed, it will be necessary, if a less number of tickets be required, to set the hands at a number the difference between which and the full number of the index is equal to the number of tickets required. Thus, if the index work up to 10,000, and 4,000 tickets only of that particular pattern for which the machine is for the time being arranged be required, the hands of the index must be set so as to start from 6,000, the difference between which and 10,000 gives the number required. The machine is also arranged to stop and give notice when an

imperfect ticket is under operation, and when from that, or any other cause, the tickets fail to be regularly delivered into the tube, E, by the following means;—On the shaft of the plunger, at the bottom of the delivery-tube, are fixed two arms, $E^5 E^5$, fig. 1, which carry a vertical rod held between them by a coiled spring, one end of which bears against the lower arm, and the upper against a pin projecting from the rod. The lower end of the rod has a double arm, E^7, attached to it, and the upper end passes through a hole in the upper table of the framing, A, immediately under a plate, U (of which an underside view is given in fig. 6.) The rod carried by the arms, E^5, also carries a hammer, by which the bell, E^9, is struck, and is further formed with a nick or notch, the use of which will be presently mentioned. The bell, E^9, has a hole at the centre, through which the rod of the plunger passes, and by which the bell is kept in place, being supported by the coiled spring, E^{11}, around the rod of the plunger, the lower end of which bears against the upper arm, E^5. The plate, U, has an aperture, u, in its under surface, which receives the upper end of the rod carried by the arms, E^5, when that rod is raised by the upward motion of the plunger. The aperture, u, is covered by a sliding plate, v, except when the sliding plate is moved inwards so as to bring an aperture in it to correspond with u. This inward movement of the sliding plate, v, is effected by the tickets as they are delivered into the tube, E, coming in contact with the end piece, v^1, of the plate, which projects into the tube, E, and is kept in that position by the spring, v^2, at the back. The tickets, when successively delivered into the tube, act against the sliding-plate, and move it so as to uncover the aperture, u, into which the end of the rod rises, and so long as the delivery is regular this action will be constantly performed at each upward movement of the plunger. But when the tickets fail to force the sliding plate, v, inwards, the aperture, u, will not be uncovered, and the rod will come in contact with the sliding plate, E^{12}. In this state of the machine, the tappet on the shaft, B, coming against the arm, E^7, will cause the rod to turn, and thereby bring the hammer round against the bell, which it will strike, producing a signal which indicates that the machine requires attention. The arm, E^7, also acts on a catch, V, fig. 2, which can act upon the driving-pulley, B^4, and throw it out of gear with the clutch, B^8, whereupon the pulley will run loose, and the machine cease to be driven. A simple arrangement is also provided, by which the motion of the numbering-wheels is stopped the instant the driving-pulley has been disengaged from the clutch, B^8.

Claims.—First. The manufacture of cards and tickets from scaleboard, in the manner hereinbefore described.

Second. The machine for cutting slips or strips of cardboard, or other suitable material, transversely into cards or tickets, as represented in figs. 1, 2, and 3 of the drawings annexed, and hereinbefore described, in the general arrangement and combination of parts of which the same consists.

Third. The machine for printing, numbering, and marking cards and tickets, in so far as regards the mode of feeding or supplying the cards or tickets, the arrangements for inking the type and numbering-wheels in one or various colours, and for transposing and interchanging the same colours, the mode of distributing the ink by means of the reversing or reciprocating roller, M^2, and the arrangements by which this roller is supplied with ink from the ink-troughs, the use of side springs in the groove of the plate, D, for securing accurate registry of double or party-coloured designs, letters, or check-marks; the arrangements for discharging the cards and tickets when printed, and the arrangements by which several parts of the machine are thrown out of gear, and notice given when a determined amount of work has been performed, or when the tickets fail to be regularly delivered after printing. And

Fourth. The employment of the several arrangements in other machines, where applicable for printing, numbering, and marking.

INSTITUTION OF CIVIL ENGINEERS.

Sitting of Tuesday, April 26.

The Chair was taken by James Meadows Rendel, Esq., the President, and the Paper read was, "Observations on Salt Water, and its application to the Generation of Steam," by Mr. J. B. Huntington, Assoc. Inst. C.E.

The author commenced by noticing, that the introduction of steam navigation disturbed the laws regulating the properties of steam-boilers; the effects observed being—the increase of heat required to generate steam from salt water—the waste of fuel, from the necessity of blowing off the brine frequently, in order to prevent incrustation, and the detrimental action of the fire upon the flues, when they had become covered

with deposit. Various contrivances were enumerated for obviating these inconveniences, such as blowing off periodically, diminishing the density of the feed-water by using the condensed steam, absorbing the heat of the brine during its exit from the boiler, and using correct instruments for ascertaining the density of the salt water.

Descriptions were given of the principal inventions, and the ameliorations introduced into "Salinometers," and for the prevention of Incrustation, from 1830 to 1850; and then, after describing minutely the investigations entered into, for the purpose of drawing up the paper, the author observed, that the principle on which a good salinometer should depend, was to provide an easy means of determining the quantity of salt contained in water, at any temperature. Recourse being had to experiment, to ascertain the constituent parts of salt water, the relation of the weight of salt to the specific gravity of a solution, the boiling point of the solution, the state when under pressure, and the law of expansion, data were obtained from which general principles could be clearly established for future guidance.

Analysis of sea water showed, that the specific gravity varied from 1026 to 1031: the water from inland seas being often more dense: the Dead Sea, for instance, had a specific gravity of 1211; 1000 parts of sea water contained from 22 to 28 parts of muriate of soda, and from 8 to 13 parts of other salts, which were chiefly soluble at high temperatures, except the sulphate and carbonate of lime, which averaged together $\frac{4}{10}$ths of a part in every 1000 of sea water. Common salt containing from 94 to 96 parts of muriate of soda, and from 6 to 4 parts of other salts in 100 of dry salt. Sea salt contained from 72 to 77 parts of muriate of soda, and from 18 to 13 parts of other salts in 100 of dry salt. In the experiments, from which the results of the paper were derived, a saturated solution of common salt had a specific gravity of 1213, or 77° of the hydrometer, and 100 parts of pure water dissolved very nearly 40 parts of salt at 60°; whereas a saturated solution of sea salt had a specific gravity of 1236, or 85° of the hydrometer, for the same weight (40 parts) dissolved in 100 of water. But these were not necessarily constant, because the constituent parts of sea salt varied; the greater the proportion of muriate of soda, the less was the specific gravity for the same weight of salt in the solution.

When salt water was heated, the increase of temperature of the brine, above that of pure water, was entirely due to the salt, for the steam arising from both waters exhibited identical temperatures under similar pressures. Hence the loss arising from this source was measured, not by the density of the solution, but by the salt dissolved in a constant weight of water; for the water which was evaporated took away no more heat at one density than at another; therefore the loss must be due to the salt left behind. The capacity for heat, exhibited by brine, was greater than that of pure water, inasmuch as at a density of 39° of the hydrometer, 110 tons of coal were required to perform the duty of 100 tons, with pure water. In making such experiments, the thermometers required much attention; first, in their construction, then in the several corrections for the barometer, and the expansions of glass and mercury; which latter rendered them objectionable for testing the saltness, even if the mercury did not clog in the tube.

In the periodical blowing off of boilers, there were at least three losses to be calculated:—1st, the loss by capacity for heat; 2nd, by the injection of the feed-water; and 3rd, by the blowing out and restoring the deficiency by the feed-water. From calculations made upon two boilers, of very different dimensions, with the feed and steam in each of different temperatures, it appeared that to blow out $\frac{1}{4}$th, at intervals varying from 6 hours to 10 hours, working from a density of 30° to 35°, was the most economical system, as the quantity of fuel required became greater on either side of that limit. The following were among the general results arrived at by experiments:

The per-centage of salt in a solution, was in direct proportion to its density. The time required to attain a given degree of concentration, was directly as the departure from concentration of the original density, the capacity of the boiler, and the relative volume of steam; and inversely as the density of the feed-water, the capacity of the cylinder, and the velocity of motion. As regarded time, it was preferable to employ a low pressure, as the time consumed in arriving at a given concentration, was longer as the pressure was lower. In equal weights of salts, dissolved in equal weights of water, the more heterogeneous the salts, the greater was the density they exhibited in solution. The excess of the boiling point of a solution, above that of pure water, was not proportioned to its density, but to the quantity of salt dissolved, by a constant weight of water. The boiling point was affected by atmospheric changes, as indicated by the pressure of the steam, which balanced the barometric column. The depression of the freezing-point of brine, below 32° Fahrenheit, was similarly proportioned. The excess of temperature of the

water of any solution, above that of the steam generated from it, whether below, or above atmospheric pressure, was constant for any solution, whatever might be the pressure and the temperature of the steam; the excess being in direct proportion to the quantity of salt dissolved, by a constant weight of water. The expansion of any solution, in excess of the expansion of pure water, was in direct proportion to the salt dissolved, by a constant weight of water. The water space of boilers should be small, and the feed-water as hot as possible, to save fuel. The density of the feed-water should be kept as low as possible. In constructing salinometers, the quantity of salt left behind for every 100 parts of water evaporated, should be registered, as upon that quantity depended the calculations of effect in fuel. Hydrometer-makers should not only engrave the temperature for which the instrument was fitted, and the scale of saltness, but also the specific gravity of the sea-water on which the scale was formed, and the proportion the muriate of soda bore in 100 parts of dry sea-salt, in order to be able to make the necessary corrections for the varying saltness of the sea. And, in order to prevent the deposit of sulphate and carbonate of lime, the degree of saltness should not exceed 25 parts for every 100 parts of water, or 60° of the hydrometer.

The following Paper was announced to be read at the meeting of Tuesday, May 3rd, "Description of the Chesil Bank (Portland)," by Mr. J. Coode, M. Inst. C.E.

SOCIETY OF ARTS.

Seventeenth Ordinary Meeting.—Wednesday, April 20th, 1853.

THE Seventeenth Ordinary Meeting of the Society was held on Wednesday, the 20th instant, Mr. Russell, Vice-President, in the chair.

The name of one candidate for membership was read.

Several communications were read in competition for one of the Society's premiums: No. 83. "For the invention of a good and cheap lock, combining strength and great security from fraudulent attempts; cheapness, freedom from disarrangement by dirt, and requiring only a small key."

The first was "On Mr. E. B. Denison's new lock," by Messrs. S. Mordan and Co.

Mr. E. B. Denison explained the construction of this lock, of which two specimens had been sent to the Society for exhibition by Messrs. S. Mordan and Co., the makers. One of these specimens was a large lock for iron safes, and the other a drawer-lock of the usual size. The following is the description which had been sent in by Messrs. Mordan.:

This lock is submitted to the Society as complying with the requisition in their premium list of this year. It will be evident from inspection that both the tumblers and the "stump" of the bolt have greater strength and means of resistance to force, than in other locks of the same size; while the key of this lock, which is suitable for safes of the largest size, and capable of shooting any number of bolts, only weighs one-third of an ounce.

This smallness of the key in proportion to the size of the lock is not obtained, as in some other safe-locks, by diminishing the size and strength of the tumblers, but by giving the key nothing to do except raising the tumblers without the resistance of any springs. The bolt is shot by the handle, and the lock is thereby also completely locked without using the key at all, and the key is only required to raise the tumblers again to such a position that the handle can open the lock. Whereas in the class of safe-locks above referred to, the ultimate security is only that due to the strength and security of a small lock which is locked into the main bolt by a key made after it is shot by the handle. This mode of locking a door without using a key may be a great convenience to those who are obliged to leave their places of business before the time of locking up, and who are unwilling to leave their keys with clerks whom they might readily trust to lock up the books, and other things, by merely turning a handle; it also removes all temptation to leave the key in the lock, which sometimes exposes it to the risk of being stolen, or having an impression taken. At the same time it is free from the objections which apply to spring or self-shutting locks, though it possesses all their advantages.

The makers believe that this lock is quite as secure from picking as the famous American lock, which is much more complicated and expensive, and requires a very large key. The mode of picking, which was described in the *Encyclopædia Britannica* some years ago, but has lately acquired more celebrity from the performances of Mr. Hobbs, is here prevented, by rendering it impossible to feel or produce any pressure of the bolt on the tumblers, so long as the key, or any other instrument is in the keyhole. For when the key is pushed into the lock against the curtain, which is held up by a spring behind it, a square plug at the back of the curtain descends into a notch in the bolt, and so prevents it from being

moved at all; and it is so constructed that when the curtain-plug is in this notch, the stump does not quite reach the ends of the tumblers, and therefore, although it is perfectly easy to raise the tumblers by any key or picker, their bearing against the stump cannot be felt; and, on the other hand, if the bolt be drawn back by the handle, so as to bring the stump against the tumblers, then the curtain-plug cannot be pushed into the notch in the bolt, and the keyhole remains closed against the introduction of any instrument.

It has been stated that most tumbler locks, with keyholes of the ordinary size, can also be opened, by observing and measuring through the keyhole the distance from the drill-pin, or centre of the keyhole, at which the key begins to leave a mark on the tumblers. This is prevented here by the smallness and depth of the keyhole, both of which render it impossible to get a sight of the tumblers at the point where the key first touches them. In this way, therefore, the smallness of the key adds to the security of the lock. besides the more obvious advantage of convenience of carrying in the pocket, without the temptation to leave it out on account of its bulk; and it also renders it impossible to introduce any instrument of sufficient strength to force open by sheer violence a lock of this strength and construction. By way of security against drilling a false keyhole into the lock, there may, of course be a thick case-hardened or chilled cast-iron plate between the lock and the front of the door; and it will be observed that nothing would be gained by drilling into the curtain, as you would only in time come out through the square plug into the inside of the door, and not into the inside of the lock.

As a proof of the indifference of the lock to dirt, as well as its simplicity, the work was left as rough as possible. The tumblers are merely short lengths of hoop-iron, and both the tumblers, and the friction-plates between them, were left as they came from the roller. In fact, instead of friction being, as in other tumbler locks, a thing to be counteracted as far as possible, the friction in this lock was an advantage, as it helped to keep the tumblers steady, in whatever position they might be required to assume, either by the key or the handle; and for this purpose one or more of the separating plates is also bent a little, so as to make them always act as friction-springs on the tumblers. In tumbler locks of the usual construction, if a drop of thick oil, or any other substance, got between any tumbler and the adjacent tumbler, or plate, it might easily overcome the power of the spring to depress the tumblers, and the lock then came to a "dead lock," as there were no means of introducing a substitute for the power of the spring, so as to bring down the sticking tumbler. If a spring got broken, which occasionally happened, where they were allowed to get rusty, the same result took place; whereas, in this lock, there were no tumbler springs, and there was always the power of the handle to bring down the tumblers. It might be observed, also, that the curtain having no opening at all in it, kept the keyhole closed against dirt, and the corroding effects of a damp or smoky atmosphere.

The second paper was "On Mr. Andrews' Snail-Wheel Lock," also by Messrs. S. Mordan and Co.

This communication was also accompanied by a specimen which, it was considered, satisfied all the prescribed conditions, excepting as regarded the smallness of the key, which was of the usual size. The makers were of opinion that it was impracticable to make a very small key to a good and secure lock, unless a double action were introduced; for in all single action locks the key must be solid, and strong enough to raise the tumblers and shoot the bolt; on the other hand, a double-action lock was incompatible with simplicity and cheapness. The great recommendations of this lock were its great security from picking; its simplicity and consequent cheapness; its great originality; its unusual strength and durability; its non-liability to get out of order, from dirt or any other cause; the impossibility of making observations or measurements through the keyhole, with a view to making a duplicate key; its easy adaptation to any purpose for which locks were required.

As regarded its security, the tumblers were circular, revolving on a pivot, instead of being oblong, which was the usual form; consequently, it was impossible to feel the pressure of the bolt upon them, as in nearly all existing tumbler locks. The oblong tumblers could only have a limited action in a small segment of a circle, and were therefore susceptible of a comparatively small number of changes, whereas the changes produced by the revolutions of circular tumblers were almost innumerable. From the extremely novel construction and arrangement of this lock, it was self-evident that no sight of the tumblers could be obtained which would in any way assist an expert thief to make an instrument to open it. Its simplicity and consequent cheapness were due to the absence of all springs in connection with the tumblers; by the original form of the tumblers, which enabled them to be stamped out at the press from thin sheet iron; by the simple and direct

action of the tumblers on the bolt; and generally from its being quite unnecessary to highly finish any of the parts, and the great ease with which the whole was adjusted. Another recommendation was, that if the key should be lost, the lock would be altered in a few minutes (at little or no expense), by simply changing the relative position of one or more of the circular tumblers.

Mr. Hobbs said he saw nothing in Mr. Denison's invention which was not common to many other locks. The plan of turning the lock by means of the handle was common. Small keys for strong locks were also common; and in the French department of the Great Exhibition, there was a lock exhibited in which six large bolts were shot with a key no larger than a watch-key; but he thought the smaller the key the greater was the chance of imitating it. In regard to cheapness, he did not see anything in it to warrant its being made one penny cheaper than many similar locks; and in reference to durability, he might mention that the friction of a rough piece of metal against a smooth surface would be very destructive. The chairman had spoken of the cost of American locks; and as this had been frequently stated in the public prints, and seemed to be very generally believed, he would take this opportunity of stating that such belief or opinion was erroneous, as American locks could be made as cheap as any good tumbler lock made in England. They could make a secure lock with a solid key, as cheap as any one; but if a lock with changeable bits was required, the additional security which it afforded must be paid for. He referred to the mode pursued in England of manufacturing locks, and said, that by the old process a man could only make six dozen tumblers a day; whereas with proper tools he ought to be able to make sixty dozen. The locksmiths of this country made bad locks at a high price. The large boss on the keyhole was a great objection if it were intended for an iron safe, as it would project beyond the face of the door, and so afford facility for the use of a plug of steel and a swedge, by which a force of four tons might be brought to bear upon the lock. The keyhole ought to be flush with the door. With a small key, the surface being less, the bits could not be so numerous, or changed so frequently, and hence the number of locks of any specific size would be diminished. In regard to the second lock, it was the invention of an American, Mr. Andrews, who had patented it twelve years ago. A few had been made, but they were not found to work, and had not come into general use. Another objection to Mr. Denison's was, the two processes required to unlock it. He had always found that the public preferred something very easy and simple of manufacture, and every lock requiring more processes than common locks would be objectionable; although some bankers and amateurs did not object to one with two or three motions.

Mr. Denison remarked, in reference to Mr. Hobbs' statement, that there were strong locks, with small keys, already in existence; that these locks either required great delicacy of finish, or they were merely small locks fastening into the bolts, which bolts were shot by the handle, and therefore the security they afforded was only that due to the small lock. As to cheapness, he himself could say nothing about it, except that Mr. Mordan had fixed the price, and he thought him a competent judge in that matter; he had stated it to be lower than that of ordinary tumbler locks of the same size. He had nothing to say against American locks, which were in many respects admirable and ingenious. He quite agreed with Mr. Hobbs in his remarks about the mode in which English locksmiths conducted their manufacture, and thought they were very far behind-hand, and would be superseded by their American brethren, unless they introduced the improved systems of manufacture adopted by them in this, as well as in several other branches of trade. The size of his key had been stated to be an objection, as it was supposed that there could not be so many changes made in the bits. The lightness of the key was not, however, produced by shortening the length of the bits, but by reducing their thickness. With regard to the objection which Mr. Hobbs had made to the projection of the boss, he would merely observe, that that did not at all affect the principle of the lock, and that there would be no difficulty in obviating it in future.

Mr. Mordan said that as he did not consider Mr. Andrews's lock fairly before the meeting, as there were no models or diagrams to illustrate it, he should say nothing of it, except to ask Mr. Hobbs if it were not true that the United States Government had applied it to the mail-bags?

Mr. Hobbs stated that the first lock made by Mr. Andrews was a bank lock, and that that was picked. He then made some improvements in it, and this was also picked. He then made a snail-lock, which was applied to the mail-bags; but two years since, on the renewal of the lock contract, it had been taken out of Mr. Andrews' hands, as a superior lock had been produced by other parties.

The thanks of the Society were voted for the papers, and the proceedings terminated.

THE TRADES OF BIRMINGHAM.

The greatest activity prevails in the railway-carriage works of Messrs. Wright of Saltley, and Brown Marshall, and Co., of New Canal-street, nearly 1,200 men being employed in the manufacture of railway-carriages. A considerable portion of the work is intended for Indian and continental railways, and a large number of carriages are being made for Ireland, in anticipation of increased traffic, which the opening of the Dublin Exhibition will cause. The latter firm are at present constructing two state-carriages for high personages abroad, which, when finished, will be very splendid, and excel any of the kind yet made. The manufacture of carriages necessarily requires a large amount of iron-work, and in this particular branch Fox, Henderson, and Co. are busy, and other firms in the neighbourhood have more than an average number of wheels, &c., to make.

The gun and pistol-makers continue extremely busy, and little is now said by way of complaint of the Board of Ordnance. The fact is, that the high prices obtained for the execution of private orders render many of the manufacturers indifferent to Government contracts, owing to the lowness of the figures at which they are compelled to take them, and the annoyance of inspection to which they are subjected. The smaller masters and workmen are able likewise to obtain better employment for the Australian and Mexican markets; to which, by every ship that sails, immense quantities of Birmingham pistols are exported. Revolving pistols are now sold for double the price they fetched twelve or eighteen months ago. It is feared, however, that some efforts are being made to draw off the hands. On Thursday last placards were extensively posted through the town, announcing that a large number of gunmakers in the various branches were required for other parts of the country. Whether the men are required for the Government works at Enfield, or some other place of equal importance, is not known, but the effect upon the trade is likely to be seriously felt.

At the manufactory of Messrs. Winfield, a splendid chandelier is being made for Her Majesty, to be placed in Windsor Castle. It is from the most chaste design, and the workmanship is not inferior to anything of the kind ever before witnessed.

The small masters in the neighbouring districts of Willenhall, Darlaston, Walsall, &c., are busy. The hinge and lock-makers are well employed, and generally, in reference to the small makers of hardware goods, by whom the Birmingham merchants and factors are supplied, it may be said that they are doing better than for some years past. The wireworkers have an abundance of orders. The wood-screw trade, and indeed all others (except that of cut nails) essentially dependent upon the building business for their support, are more than usually active. Even in steel toys or carpenter's tools, notwithstanding German competition and the lowness of continental prices, the makers in Birmingham are full of work. Planemaking is brisk and prices fair, if not highly remunerative. Although files, like cutlery, are not manufactured in Birmingham, they enter largely into the business of our factors and merchants. The increase in the consumption of Sheffield make is said to be very great, and denotes the prosperity of the hardware trades in other towns besides that of Birmingham.

The glass-manufacture of Birmingham, Smethwick, and Spon-lane, continues active. The Messrs. Harris, and other firms of the town and district, are full of orders, while the Crown Glass-works of the Messrs. Chance, and those of the Plate Company at Smethwick, exhibit every sign of greatly-extended establishments. It would be difficult to describe adequately the gigantic works of the Messrs. Chance at Spon-lane, or to state with anything like accuracy the immense orders they now have on hand; something like approaching to their extent may, however, be guessed at by those who, residing in the neighbourhood, witness the hundreds of families, if not thousands of persons, to whom this enterprising firm give employment, and the benefits which in every imaginable way they confer upon this populous neighbourhood.

The brass-founders and braziers of the district already begin to feel the advantages derived from the reduction in the price of copper, and if speculators do not obtain possession of the supplies expected from Russia, of which suspicions are entertained by parties interested in the trade, still greater activity than at present existing is confidently anticipated.

THE IRON TRADE.

The iron trade continues brisk; more furnaces have lately been blown in, and the demand for sheets, plates, and rails is unabated. For sheets, more especially, the call was never exceeded; and this is considered the more remarkable as the cut-nail business, in which large quantities of this description of iron are consumed, is at the present time much depressed. The heavy orders recently received from American merchants in Liverpool, as well as from

others in different parts of the kingdom, for iron required for ship-building, render the iron trade of South Staffordshire extremely active.

Glasgow Pig-Iron Market. — *Glasgow, April*, 23.—The market for pig-iron, which had been rather inactive during the week without any material alteration in price, gave way to-day under pressure of heavy sales on London account, and business was done at 53s. to 52s. 6d., closing heavy with sellers at the latter rate. No. 1, g.m.b. quoted 53s. 6d.; No. 3, 53s.; No. 1 Gartsherrie 55s. 6d. to 56s.—cash against bill of lading.

America.—By the steamer *Niagara*, which brought advices to Liverpool on Monday, dating from New York on the 12th, and from Boston on the 13th, we learn that Scotch pig-iron was in good demand at 37 to 39 dollars per ton. The United States' Mail Steamer *Atlantic* arrived at Liverpool on Wednesday, with advices from New York to the 16th instant. We learn from these that Scotch pig-iron on the spot was neglected, while for future delivery it was actively sought after. 500 tons to arrive in May, June, and July, changed hands at 34, 33, and 32 dollars, customary credit.

TRIAL TRIP OF THE "ARGO."

Such a fatality has attended the various steam-ships bound to Australia, causing an amount of loss and inconvenience to the mercantile public which can scarcely be estimated, that the Directors of the General Screw Company, determined to test fully the qualities of the *Argo* before sending her to sea, made a trial trip in the Channel of much longer than average duration, in the course of which the actual powers of the ship, both under steam and canvas, have been freely exhibited.

The *Argo* is an iron screw steam-ship, of 1,800 tons, built by Messrs. Mare and Co., of Blackwall, with engines of 300 horse power, by Messrs. Maudslay, Sons, and Field. She left the Nore on Friday morning, and proceeded down the Channel under steam alone, with the wind moderate ahead, at an average rate of 10 knots. During the first twelve hours she was in company with the Spanish paddle-wheel war-steamer, *Fernando el Catolico*, of 1,500 tons and 500 horse power. Under the circumstances of moderate weather and smooth sea, there was no apparent difference in the speed of the two vessels, but as soon as the wind and sea rose, the superiority of the screw over the paddle was demonstrated by the *Argo* rapidly going ahead of her opponent. During Saturday, the vessel being well down Channel and in open sea-way, she was put under all plain sail, and the screw feathered; with a very light breeze the vessel went 7 knots, close hauled, passing several sailing-ships at the rate of 2 to 3 knots an hour. Subsequently, the wind freshening to a steady breeze, the ship was stayed, and a speed of 11 knots was obtained, the screw being still feathered and the engines at rest.

A complete series of experiments was then undertaken to ascertain the time required for feathering the screw, which was found to be readily done in 7 minutes from the time of stopping the engines.

In addition to feathering the screw, there is also in this vessel a means of disconnecting it entirely from the engines, and allowing it to revolve as the vessel passes through the water under sail. Under these circumstances the ship was also found to be efficient under sail alone, but the speed was not so great by 2 knots an hour as when the screw was feathered. There is also a means of raising it out of the water for the purposes of inspection when at sea, if required.

Mr. John Lambert, Mr. J. R. Thomson, Mr. R. M. Fox, M.P., Captain Shuttleworth, and Mr. Acworth, Directors of the Company, were on board, with a large party of shareholders and scientific gentlemen, including Mr. Henry Maudslay, Lord Chewton, Messrs. Storey, Lechmere, Barrup, Boyd, Logan, &c. The experiments were conducted by Captain John Ford, the Company's superintendent, and Mr. W. B. Lambert, the Company's superintending engineer, and the result of the trial has been to prove the complete efficiency of the *Argo* as an auxiliary screw steam-vessel, and that she can, with perfect certainty, be used either as a fast steamer or as a rapid sailing ship, as the circumstances of wind and weather may render advisable.

It is but justice to the engine-makers to state, that during the whole of this trial the machinery worked admirably, and that there were no symptoms at any time of heated bearings or want of steam. Captain Hyde fully expects to be able to make a run with the *Argo* from Southampton to Port Phillip in from 55 to 65 days, according to weather. She is to leave on the 4th proximo, in continuation of the line of steamships between Southampton and Australia, commenced on the part of this Company by the departure of the *Harbinger* in February last.

THE "HOPE."

THE African Steam Ship Company's mail packet *Hope*, Commander W. H. Bowen,

sailed from Plymouth on Sunday with the African mail, in charge with Lieutenant Pierce, the mail agent. This is the first voyage of the *Hope*, which is a sister ship to the *Faith*, belonging to the same enterprising Company. Like the others, she is constructed of iron, and is of 900 tons burden. She is provided with iron tubular masts, which admit the top masts into them, and allow the ship to be made snug when encountering strong adverse winds—an arrangement proved to be both advantageous and economical for this service. Her diagonal cylinder engines (on the same plan as those so successfully adopted in the Cape steamers), are constructed by Mr. George Forrester, of Liverpool; they are of 200-horse power, and revolve her three-blade propeller 52 times per minute, with a consumption of 15 tons of fuel in 24 hours. The boilers of the *Hope* are placed one in each wing, and either can be used separately. Her feed-engine, besides filling the boilers, can be readily adapted to washing decks or extinguishing fire. The *Hope* is fitted with a telegraph, having one dial on deck and another in the engine-room. When any alteration of the steam power is required, a movement above strikes a bell below, and the dial-hand points immediately to "go ahead," "back astern," &c., so that all the hoarse bawling and occasional error by the ordinary mode is avoided. The arrangements below enable the engineer to command at one view the entire economy of the engines and boilers.

LAUNCH OF THE "JAMES WATT."

The *James Watt*, 90-gun ship was launched on Saturday, at the Royal Dockyard, at Pembroke. For some time the greater portion of the dockyard strength had been placed upon this vessel, in order to insure her early completion, and up to a late hour prior to the interesting event, heavy gangs, of men were actively and incessantly occupied in the work. Ample accommodation had been provided by the authorities for the convenience of a large body of spectators, who were admitted into the yard, while every eminence and point from which a view could be obtained was densely crowded. As the time of high water drew near, every preparation having been made, at about five o'clock in the afternoon the "dogshores" were knocked away, and this fine vessel glided majestically into the water amid the hearty cheers of the assembled multitude. She was named, with the customary ceremony, the *James Watt*, and the lady who officiated on the occasion was Miss Pasley, daughter of Sir Thomas Pasley, bart., the captain superintendent of the dockyard. On reaching the water the *Magicienne*, 16, steam-sloop, Captain Thomas Fisher, thundered a salute of 21 guns, and the band of the dockyard brigade played "Rule Britannia." The waters of the magnificent haven were studded with vessels of all descriptions and rig, from the man-of-war to the smallest boat.

The *James Watt* is a two-decker, and is pronounced by competent judges to be as fine a vessel as was ever launched. She is fitted with the auxiliary-screw propeller, and has Robinson's patent tiller, which is necessary, as the shaft of the screw comes up through the cabins, and it is therefore requisite, in order to clear the casing of the shaft, to have recourse to a long tiller. She is fitted with an outside balcony and spacious galleries.

Her armament will be—28 8-inch broadside guns and 62 32-pounders (broadside), of 56 cwt., and 9 feet 6 inches in length. In addition, she will carry a 68-pounder, 10 feet long, as a pivot-gun.

The following are her principal dimensions as she now floats on the water, but they have been considerably altered from those originally laid down:

	Ft.	In.
Length over all	265	3
Length between perpendiculars	230	0
Length of keel for tonnage....	194	6¾
Breadth, extreme	55	5
Breadth for tonnage	54	7
Breadth moulded	53	9
Depth of hold	24	7½
Burden in tons, O. M.	3,083	7-94
Burden in tons, N. M.	2,908	5-20

The *James Watt* will be taken round to Plymouth by Mr. Brown and his party of seamen-riggers, and, on arrival at that port, will immediately be got ready for commissioning.

RAILWAY GRADIENTS.

To the Editor of the Mechanics' Magazine.

Sir,—More than twenty years ago I obtained room in your pages for some well-founded, and some doubtful notions in regard to the true theory of locomotion, with a prediction drawn from them that steam carriages could not succeed on common roads; and I also claimed for myself the merit of having made a steam locomotive that ascended on plain wheels an incline rising one in six, then thought by me to approach a maximum.

Judging by the practice of the present day, the true theory of locomotion is not yet understood, or at least not acted upon.

We hear talk of trains not getting on

owing to "greasy rails," "want of bite," &c., &c., and occasionally a train cannot get out of Liverpool by reason of "the rails being in a greasy state," and sand must be strewed on them. About a year ago, a presumed great feat was accomplished in Austria, that of a train ascending an incline of 1 in 40, or 182 feet per mile; and I have since seen an engine so ill-constructed, that it cannot effect half the work of traction that its separate parts are capable of. These things ought not to be, would not be, if the true principle were acted on.

Any quantity of "bite" may be had in all states of the rails, provided the engines be suitably constructed.

The amount of "bite" of any set or sets of driving-wheels may be pre-known by hanging behind them over a pulley as much weight as will, without turning them round, drag them backwards by main force. On "greasy" rails a less weight will drag them back than on dry rails.

Now, supposing it require 1 ton hung over a pulley to drag back the driving-wheels of a locomotive engine, and it require 25 cwt. hung over a pulley to drag forward a rolling train, it may be foreseen that it will be vain to yoke that engine to that train; take it away, and put to an engine that will require 30 cwt. to drag back the driving-wheels, and then the train goes on, greasy, or not greasy.

The above considerations have lately set me to push the theory or principle to, I think, its extreme point, and the result has astonished myself. My locomotive carriage (moved by a spiral spring) will ascend an incline rising 2,500 feet per mile, or nearly one in two, and will drag its own weight up an incline rising 1,000 feet per mile, or 1 in 5.

These ascents are of course impracticable, and not wanted in real business, but the fact shows what knowing and adhering to the true principle will effect.

I hope in some way or other to bring this little carriage before the public, of whose notice it is well worthy.

I am, Sir, yours, &c.,

SAXULA.

April 25, 1853.

THE ELECTRIC TELEGRAPH IN THE HOUSE OF COMMONS.

In the course of the last few days an electric telegraph station has been opened adjacent to the lobby, by the Electric Telegraph Company, for the use of members and parties engaged in Parliamentary proceedings, and direct telegraphic communication is thereby obtained with all parts of the country, and intelligence transmitted to the provinces of divisions and debates. Operations were yesterday commenced for placing an electric clock over the principal entrance to the lobby, and a general system has just been introduced of notifying to members in all parts of the House the precise moment of a division by the electrical ringing of 30 bells in various directions, the bells being set in motion by an apparatus in charge of one of the officers of the House at the lobby door. Wires are also being carried from the House to the Carlton, Reform, and other clubs, for the intercommunication and information of members.

The Dutch Submarine Telegraph.—The work of laying down the electric telegraph from Ipswich to Orfordness, to be connected with the submarine communication thence to Holland, was commenced on Monday last. The brow of the first hill on the Woodbridge-road was selected as the starting-point of operations. The iron pipes in which the cable will be enclosed are laid at a depth of about 2 feet below the surface, and a stout wire is passed through, temporarily, for the purpose of drawing the cable itself through when the state of the works will admit of it. Between 40 and 50 men are engaged upon the work, and nearly a mile is already completed. The iron pipes, it appears, will not be used beyond the Duke of York public-house, at the foot of Albion-hill, Woodbridge-road, on account of the great expense, and earthenware pipes will be employed instead. It is stated that about 4 miles of this description of pipe will be delivered on Saturday next. Some deviation in the course through the town has been determined upon, as it has been intimated by the Eastern Union Company that no opposition will be offered to the junction being effected with their standards at the Audit-office in the marshes, instead of at Stoke. This will materially shorten the distance and diminish the outlay, as well as avoid the inconvenience to which the traffic to the town would be exposed by the breaking up of the streets leading to the station.—*Suffolk Chronicle.*

SICARD'S DIVING-APPARATUS.

We mentioned some time ago that an experiment had been made in the Seine of a diving-apparatus invented by a M. Simon Sicard. A second trial has just taken place. M. Victor de Grandchamp, a friend of the inventor, was let down into the river at 23 minutes after 1 o'clock, seated on an

iron chair at a part of the river near the Ile des Cygnes, where the water is not less than 15 feet deep. On reaching the bottom M. de Grandchamp quitted the chair, commenced his subaqueous promenade, and again came up at 48 minutes after 1,—thus making 25 minutes that the experiment lasted. The apparatus is very simple. It consists principally of a metal box, which the diver carries on his back like a knapsack, and in which is produced an artificial atmosphere, which remains the secret of the inventor. To this box there are two openings corresponding to a kind of helmet, which forms the head-dress, and which terminates at the back by two tubes in caoutchouc about 20 centimetres long; these tubes conduct the artificial air contained in the box to the interior of the helmet. The dress is in caoutchouc, and reaches from the shoulders to the feet. The extremities of the arms have the form of gloves, in order to give free action to the fingers, and the legs are terminated by socks. This dress opens on the breast, and is arranged in such a manner that it can be closed hermetically enough to entirely exclude water. The part over the chest is strengthened on the inside by a kind of cuirass, in order that the pressure of the water may not prevent free respiration. The helmet is of a round form, and large enough to admit of the head moving about in every way. It is furnished in front with three round glasses, one in the middle opposite the eyes, and the others on the sides. To the waist-belt of the dress are adapted several leaden weights, heavy enough to act as an equilibrium to the water. The socks are composed of leaden sandals, fixed to the legs by means of straps. The system is completed by a lantern, which burns under water. Three times during the experiment, which was attended with the most complete success, M. Grandchamp came to the surface bringing with him stones from 20lb. to 30lb. weight, without requiring any fresh supply of air beyond that at first contained in the box.

THE GOODWIN SANDS' REFUGE.

Our attention has recently been called to the project for forming a harbour of refuge and breakwater, on a recoil principle, proposed by Mr. Smith, an engineer, which promises to be successfully carried into effect at a cost comparatively small. The models of the recoiling breakwater, and of the lighthouse, have been exhibited to us during the week at the office, No. 2, King's-arms Yard, Moorgate-street, and these being extremely simple in point of principle, the following description will serve to convey an idea of the nature and extent of the contemplated work, which was fully gone into some time ago at one of the ordinary meetings of the Society of Arts. The breakwater will consist of a number of independent frames or gratings, through the several parts of which a portion of the broken wave may pass, each about 50 feet long and rising from the bed of the sea about 15 feet above high-water mark. Each frame will be secured at the base by a suitable shackle to pile-heads, for which Mitchell's screw-pile is peculiarly adapted. This eminently simple and ingenious instrument can easily be bored into sand or chalk, and, having an expanded plate with a cutting-edge upon it, forms with ease and certainty a fixed point of attachment under water. The frame being upright in the water in its normal position, is restrained in its revolution about its base by jointed stays and holdfasts secured under water in a similar manner, but kept out of the straight line by heavy weights suspended at the joints. Thus, upon a heavy sea striking a frame, it yields to the impact, and the concussion expends itself in straightening the holdfasts. Immediately afterwards the frame returns to its original position by the action of two concurrent forces—the pressure of the water and the weights upon the stays.

The limits of the motion of the frames in the heaviest seas are well-known, and may be allowed for with certainty. As it is estimated that every separate wave in a gale can only impel even a free drifting body 10 feet, the open frame cannot be driven that limited distance; and at 10 feet the strain on the iron braces would be only one-twelfth of what they can bear. By this contrivance smooth water will be produced on the other side, and an available harbour formed for refuge in the most dreaded winds.

The peculiar character of the structure thus produced is highly adapted to the requirements of the situation. Anything in the nature of a fixed edifice cannot be attempted, as the chalk formation crops out in the middle of the straits, and a depth of about 100 feet of sand, constantly shifting its position with wind and tide, rests upon it. It is intended to erect the breakwater in deep water in front of the sands, beginning the work near the South Sand Head, so that vessels may reach it with an ample depth of water around; in which case it would become a safe and sheltered anchorage to the Channel and the Gull Stream for vessels navigating the Downs. Over the line of frames, which is to be 2,000 feet in length, will be a roadway supported on independent pilings and a tower, with a

lighthouse and asylum for mariners, are embraced in the plan.

The principle of the asylum is the same as that of the breakwater; the yield, even in a gale of wind, will be almost imperceptible. There is no other way of erecting lighthouses or similar structures in deep water, or in bad and sand bottoms, as a safe and permanent structure. Light-ships have, therefore, been employed at a considerable expense, with a number of men as a crew, sufficient to manage them when they go adrift. In case of accident, there is not the loss of the light-ship and crew alone, but possibly of vessels in the same gale, misled by not seeing their accustomed beacons, and often in hazy weather from missing their lights, as nothing but a lighthouse will admit of the requisite size, height, and power. This asylum presents the greatest strength of wrought iron in the direction of the strain; that is, the line of tension and the minimum of surface resistance to the wind, draft, and blow of the wave.

This great undertaking is to be carried out at the estimated cost of 100,000*l.* It has met with the approbation of many well-known men in the mercantile community, and has been placed upon the footing at once of a humane and economical measure; a mode of proceeding sufficiently justifiable by the melancholy consideration, that it is recorded by *Lloyd's*, that within eighteen months, 500 lives and 500,000*l.* worth of property have been lost between the Isle of Wight and the Thames, a greater portion at the Goodwin Sands than in any other locality.

PROVISIONAL PROTECTIONS.

Dated November 23, 1852.

823. Auguste Edouard Loradoux Bellford. Improvements in drying-furnaces. A communication.

Dated March 8, 1853.

584. Samuel Cunliffe Lister. Improvements in machinery used in washing wool.

Dated March 12, 1853.

625. Nicholas Auguste Engéne and Leopold Mouren. Certain improvements in the treatment of corn and other grains, and more especially in all that concerns washing, drying, grinding, curing, and preserving them.

Dated March 16, 1853.

656. Edward Nickels. Improvements in preparing lubricating matters. A communication.

Dated March 22, 1853.

698. Samuel McCormick. Improvements in manufacturing screws, bolts, spikes, and rivets, and other similar articles, and in the machinery or apparatus used for such manufacture, parts of which machinery are applicable for forming screw threads, mouldings, and ornaments on metal.

Dated March 28, 1853.

740. George Edward Dering. Improvements in preserving, or preventing decomposition in vegetable and animal substances and matters.

Dated March 29, 1853.

747. Henry Lee Corlett. Improvements in railway wagons.

Dated April 5, 1853.

815. Smith Flanders. Certain improvements in the construction of ploughs.

817. William Pidding. Improvements in the manufacture of woven, textile, or other fabrics, and in the machinery or apparatus connected therewith.

819. Thomas Carr. Improvements in nails and other fastenings, and in the machinery or apparatus employed in the manufacture thereof.

821. William Pidding. Improvements in the preparation or treatment of twine or other threads, or cuttings of paper or other waste for the production of useful and ornamental articles.

Dated April 6, 1853.

823. Frederick Albert Gatty. Improvements in printing or producing colours on textile fabrics.

825. Henry Leachman. Improvements in the manufacture of iron. A communication.

827. William Radford. Improvements in the construction of metallic beams or bracings and metallic sheets or plates, applicable to the building of ships and other structures where lightness and strength are required.

829. William Johnson. Improvements in the manufacture of safety paper. A communication.

Dated April 7, 1853.

831. John Fry Heather, M.A. A pneumometer for determining the densities or specific gravities of gases.

833. William Morgan. Improvements in paper and cardboard-cutting machines.

835. Frederick William Mowbray. Improvements in apparatus used in preparing and combing wool and other fibrous materials.

837. Edward Langdon Bryan. Improvements in warming and ventilating rooms and buildings.

839. Robert Pattison Clark. Improvements in machinery for loading and unloading colliers and other ships and vessels.

841. Leopold Joseph Green. Improvements in axletree-boxes.

843. William Fuller. Improvements in ice-pails, or apparatus for refrigerating.

Dated April 8, 1853.

844. George Frederick Goble. Improvements in safety-valves for steam boilers and gas-chambers.

846. William Moseley. A new method of railway traction, to be called a pony railway.

847. George Humphrey. An improved self-acting safety-valve for locomotive, marine, and other steam boilers.

848. Alexander Samuel Braden. Improvements in apparatus for roasting coffee, cocoa, and other vegetable matters, and for cooling the same when roasted.

849. Jean Joseph Theodore Pratviel. An improved machine for doubling, twisting, and reeling fibrous substances.

850. Patrick Francis Flanagan. Improvements in the manufacture of hats for yachting and general purposes.

851. Henry Oliver Robinson. Improvements in machinery for crushing sugar-canes.

852. George Herbert. Improvements in con-

structing and mooring light-vessels, buoys, and other similar floating bodies.

853. Joshua Farrar. Improvements in the treatment of flax, line, grasses, and other fibrous substances.

854. Stephen Taylor. Improved machinery for weaving seamless goods. A communication.

Dated April 9, 1853.

855. George Frederic Goble. Improvements in machinery to be actuated by water or air.

857. Herbert Taylor. Improvements in ornamenting surfaces or fabrics applicable to various useful purposes, such as for covers of furniture, imitation tapestry, carpets or hangings. A communication.

858. Adolphe Marius Alexandre Iglesia. Improvements in producing ornamental glass surfaces.

859. William Penn Cresson. Improvements in lathes and parts connected therewith, for the purpose of reducing and smoothing the surfaces of certain metal wares. A communication.

Dated April 11, 1853.

860. John Boydell Gibson. Improvements in saddlery and harness.

861. John Fuller Boake and John Reily. Improvements in signal-posts for railways, and apparatus connected therewith.

862. Robert Bostwick Ruggles and Lemuel Wright Serrell. Improvements in machinery for beating gold and other laminæ of metal.

863. Robert Garrard and John Garrard. Improvements in bonnets.

864. William Urquhart. Improvements in the manufacture of printers' type and other articles used in letter-press printing.

865. William Russell Palmer. Improvements in the construction and arrangement of machines for the application of horse power, which he designates as "Palmer's improved horse power."

866. William Russell Palmer. Improvements in machines for threshing seeds and grains, and for cleaning them from the straw and chaff after they are threshed, which he designates as "Palmer's American seed and grain-thresher and winnower."

867. Hugh Donald. Improvements in machinery for cutting and uniting metals.

868. William Muir Campbell. Improvements in earthenware kilns.

869. Donald Nicoll. Improvements in garments, and in sewing or uniting the seams of the same.

Dated April 12, 1853.

870. Samuel Russell and Robert Murray Mc Turk. Improvements in metallic handles for table cutlery, daggers, and such like instruments.

871. Henry Blake. Improvements in railway wheels.

872. Richard Archibald Brooman. Improvements in grinding and pulverizing gums, gum resins, and other drugs and articles of a similar character. A communication.

873. Alexander Turiff. Improvements in the prevention of accidents on railways.

874. Henry William Harman. Improvements in steam engines.

875. James Taylor, Isaac Brown, and John Brown. Improvements in the manufacture or production of charred peat.

876. Auguste Mondollot. Improvements in filling vessels with aërated waters, and the apparatus employed therein. A communication.

877. Downes Edwards. Improvements in signal apparatus for railways.

878. Thomas Greenwood. Improvements in evaporating saccharine fluids.

879. Richard Greville Pigot. Improvements in caltraps for military purposes.

880. François Felix Verdié. Certain improvements in welding cast steel with iron, steel, cast iron, and other metals.

881. Robert John Kaye and John Ormrod Openshaw. Improvements in obtaining motive power by electro-magnetism.

882. Eliza Cunnington. Improvements in the decoration of furniture panels and other surfaces.

883. John Smith. An improved mode of suspending carriage bodies.

884. Alfred Vincent Newton. Improvements in steam boilers, and in the mode of supplying the same with water. A communication.

Dated April 13, 1853.

886. Nathaniel Clayton and Joseph Shuttleworth. An improvement in portable and locomotive steam engines.

888. William Pearce. Improvements in the construction of locomotive engines, parts of which improvements are applicable to other engines. A communication.

890. James Noble. Improvements in preparing cotton and other fibres.

892. Francis Burden. Improvements in treating rovings for spinning.

894. James Noble. Improvements in preparing cotton and other fibres.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 22nd,* 1853.)

769. François Vallée. Improvements in preparing, spinning, and doubling flax, cotton, wool, silk, and other fibrous materials.

807. Charles Goty. Improvements in pumps for raising and forcing liquids.

912. William Jeffs. Improvements in manufacturing letters, figures, and ornamental work, and in the mode of attaching the same to wood, stone, iron, and certain other materials.

(*From the "London Gazette," April 26th,* 1853.)

813. John Weems. Improvements in obtaining motive power.

823. Auguste Edouard Loradoux Bellford. Improvements in drying-furnaces. A communication.

836. William Oldham. An improved dibble-drill.

837. Augustus Turk Forder. Improvements in fenders for railway carriages.

885. George Augustus Huddart. Certain improvements in tools for cutting or abrading metallic and other surfaces.

888. George Augustus Huddart. Improvements in facilitating combustion in steam-boiler furnaces.

889. George Augustus Huddart. An improved manufacture of artificial flies.

905. Matthew Samuel Kendrick. Improvements in grates and fire-places.

925. George Augustus Huddart. Improvements in the construction of boilers and furnaces for generating steam.

930. John Dable. An improvement in rolling metals.

793. Ebenezer Poulson. An improved mechanical purchase applicable to working ships' and other pumps, and to similar purposes.

957. John Rowbotham. Improvements in timekeepers and apparatus connected therewith, for ascertaining the attendance on duty of watchmen

and other persons having charge of property. A communication.

1008. William Baddeley. Improvements in the manufacture of metal pipes. A communication.

1021. Julien Boilesve. An improved desiccating apparatus. A communication.

1052. William Irlam. Improvements in railways.

1065. John Mason. Improvements in the processes of bleaching and dyeing textile materials and fabrics.

1089. Frederick Joseph Bramwell. Improvements in steam engines.

208. William Galloway and John Galloway. Improvements in steam engines and boilers.

402. Benjamin Cook. Improvements in apparatus for lighting fires.

467. William Johnson. Improvements in the treatment or manufacture of caoutchouc. A communication.

548. William Sandilands. An improved hopper for a pianoforte.

550. Henry McEvoy. An improvement in covered buttons.

563. William Barrington. Improvements in life-boats.

584. Samuel Cunliffe Lister. Improvements in machinery used in washing wool.

589. Thomas Glover. A certain improvement in the construction of buttons, and in the mode of applying the same to gloves and other articles of dress.

600. Theophilus John Nash. Improvements in churns.

656. Edward Nickels. Improvements in preparing lubricating matters.

689. Thomas Sykes. Improvements in the treatment of soapy and greasy waters. A communication.

698. Samuel McCormick. Improvements in manufacturing screws, bolts, spikes, and rivets, and other similar articles, and in the machinery or apparatus used for such manufacture, parts of which machinery are applicable for forming screw-threads, mouldings, and ornaments on metal.

729. George Isaac Jackson and Henry David Jackson. Improvements in fasteners for buttons.

740. George Edward Dering. Improvements in preserving or preventing decomposition in vegetable and animal substances and matters.

765. John Carter Ramsden. Improvements in looms for weaving.

773. George Hanson and David Chadwick. Improvements in apparatus for measuring gas, water, and other fluids, which improvements are also applicable for obtaining motive power.

796. William Edward Newton. Improvements in producing plates or surfaces which may be used as printing or embossing surfaces, or as door-plates, dial, or number-plates, or other plates or surfaces bearing inscriptions or devices of various kinds. A communication.

798. Robert William Sievier and James Crosby. Improvements applicable to looms for the manufacture of textile fabrics.

801. William Walker. Improvements in drying malt.

823. Frederick Albert Gatty. Improvements in printing or producing colours on textile fabrics.

824. James Jerram Pratt. Certain improvements in stockings.

834. John Grist. Improvements in machinery for the manufacture of casks, barrels, and other similar vessels.

835. Frederick William Mowbray. Improvements in apparatus used in preparing and combing wool, and other fibrous materials.

837. Edward Langdon Bryan. Improvements in warming and ventilating rooms and buildings.

838. Colin Mather. Improvements in power-looms.

839. Robert Pattison Clark. Improvements in machinery for loading and unloading colliers and other ships and vessels.

848. Alexander Samuel Braden. Improvements in apparatus for roasting coffee, cocoa, and other vegetable matters, and for cooling the same when roasted.

851. Henry Oliver Robinson. Improvements in machinery for crushing sugar-canes.

852. George Herbert. Improvements in constructing and mooring light vessels, buoys and other similar floating bodies.

859. William Penn Cresson. Improvements in lathes, and parts connected therewith for the purpose of reducing and smoothing the surfaces of certain metal wares. A communication.

878. Thomas Greenwood. Improvements in evaporating saccharine fluids.

886. Nathaniel Clayton and Joseph Shuttleworth. An improvement in portable and locomotive steam engines.

923. Joseph Dunning. An improvement in the construction of coke-ovens.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATION.

898. Moses Robinson. Certain improved means for preventing accidents on railways. April 14.

923. Joseph Dunning. An improvement in the construction of coke ovens. April 16.

929. William Walker Stephens. The application of retorts in gas-ovens or other ovens, and of gas-ovens or other ovens which are constructed as retorts, to the process of improving iron, and converting iron into steel. April 18.

WEEKLY LIST OF PATENTS.

Sealed April 22, 1853.

1852:

488. Juliana Martin.

505. William Macbay.

Sealed April 23, 1853.

1852:

581. Julian Bernard.

583. Richard Archibald Brooman.

630. Henry Spencer and Edmund Taylor.

756. Francis Montgomery Jennings.

996. John Symonds and George Mouchet.

1015. John Sheringham.

1048. James Bell.

1853:

307. John Perkins.

320. John Whitehouse the elder, and John Whitehouse the younger.

388. John Bethel.

522. Edward Duke Moore.

536. Samuel Colt.

538. Samuel Colt.

Sealed April 26, 1853.

1852:

520. Claude Mamès Augustine Marion.

524. Charles Rowley.

Sealed April 27, 1853.

1852:

590. William Petrie.

878. Thomas Charles Medwin.

1075. Charles Barlow.

1853:

47. Charles William Lancaster.

135. Celestin Malo.

138. Peter Rothwell Jackson.

142. Richard Mountford Deeley.

218. Thomas Symes Prideaux.

357. William Ball.

453. John Richard Cochrane.

458. Reuben Plant.

459. Robert Milligan.

469. Thomas de la Rue.

477. William Symington.

493. Charles Tetley.

494. Charles Tetley.

501. Edward Hammond Bentall.

505. Samuel Cunliff Lister.

507. Thornton Littlewood and Charles Littlewood.

512. William Rowett.

515. Robert Lewin Bolton.

517. Charles Henry Hall.

523. Lewis Jennings.

535. Samuel Colt.

537. Samuel Colt.

546. George Elliott.

552. James Boydell.

585. John Wright.

586. Alexander Samuelson.

587. Frederic William Emerson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
April 25	3454	J. Budge	St. Pancras	Clack-box and feed-pipe for locomotives.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

April 27	504	D. Harcourt	Birmingham	Model-stand.
28	505	F. Arnold	Barnsbury	Bookbinding.

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Mechanics' Magazine.

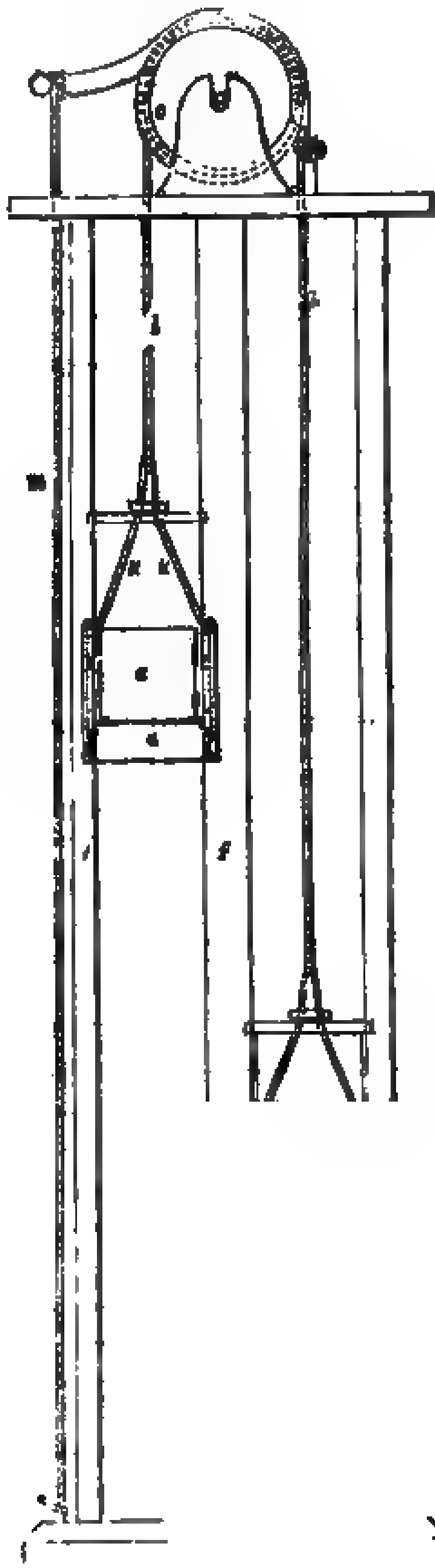
No. 1552.] SATURDAY, MAY 7, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

SLADE'S PATENT SAFETY HOIST.

Fig. 1.

Fig. 2.



SLADE'S PATENT SAFETY HOIST.

The invention to which the accompanying figures refer, has for its object the elevation or lowering of heavy weights through considerable spaces, with perfect safety to the individuals who may be ascending or descending with them, or to those who may be underneath, in case of any accident happening to the rope or chain employed for the purpose. Being also applicable to numerous cases occurring in practice, where economy of manual labour and of time are desirable, such as in the "teagles," or "hoists" of factories, the transference of men and building materials between the several stages of scaffolding during the construction of large edifices, and a variety of mining and other purposes embracing similar objects, it promises a very extensive and useful reform in the means hitherto employed for these several purposes. The advantages which would attend its use in the case of extensive building operations, cannot fail of being recognised as highly valuable, and of a nature to ensure its introduction on a large scale. They have formed the subject of a minute inquiry by practical men, and in alluding to this particular application of the machine, we shall exhibit the results of the comparison, made on competent authority, between the existing system of practice, and that which would take place in conjunction with Mr. Slade's contrivance. As will be readily acknowledged from a consideration of the simplicity and absolute efficiency of it under any circumstances, the points stated above are its general and leading characteristics, as regards mechanical advantage, and a philosophical application of labouring force. Practical men concerned in occupations where very heavy weights are required to be raised or lowered constantly, at or near the same spot, will as readily perceive that the employment of it places within their reach an economical re-organization of their establishments, which they may easily effect, at the same time that risk from damage to goods, or loss of life and limb, will be entirely cut off.

That accidents occur under circumstances when they are not to be expected, is unhappily a circumstance within the cognizance of most people; and there is reason to believe that if their occurrence were not frequently concealed, their number would prove to be far greater than is supposed. Those, however, which do meet the eye and the ear, are numerous enough, and shocking enough, to justify, on the ground of humanity,—setting aside all considerations of pecuniary advantage which might arise from superior economy, —the attempt to cut them off entirely. By Mr. Slade's arrangement, there can be no question that this important object will be completely and satisfactorily accomplished. For many years past his attention has been directed to this subject, and he is the author of another curious lifting arrangement, known in Cornwall as the "man-engine," which is used for raising and lowering men in the shafts of mines. This machine consists in giving an alternating motion to a strong lever, from the ends of which hang frames moving vertically in guides. Stages are fixed at intervals on these, which meet in the centre of the shaft, and by stepping from one stage on one framing to another stage on the other framing, when the motion of the lever has brought them to a level, the men are ultimately raised to the top of the shaft, or lowered. Though more safe than a mere tub, or wagon suspended by a rope, this arrangement does not effect the same objects of perfect safety, economy of power and of time, as this does, nor is it so simple and inexpensive. The general nature of the patent hoist may be described as consisting in such an arrangement of parts, that the weight, say of the men descending on one stage, or other contrivance used as the hoisting vehicle, may, by that stage being attached to one end of the hoisting-rope, act as a counterbalance to the weight suspended to, and raised by the other end.

Fig. 1 shows a side view, and fig. 2 an edge view of the apparatus, constructed according to the patent, and intended for raising or lowering persons or weights; a form of the arrangement suitable for the shafts of mines, or the hoisting apparatus of mills, or other places. *a a* are the stages or vehicles for receiving the persons or weights to be raised or lowered. These stages, it will be seen, are suspended by each end of the rope, *b*, which passes round the drum or pulley, *c*, fixed on the axis, *e*. The necessary alternating rotary motion may be given to this axis, *e*, for raising and lowering the stages by a steam-engine, or other suitable power. The stages, *a*, have each a door, a^1, and are guided in their ascending and descending motion by projecting pieces, a^2, attached to them, and partially embracing the upright parts of the framing, *ff*. *g g* are levers turning upon a fulcrum at *h*, and firmly fixed to the stages, *a*. The longer arms of these levers receive a tendency to be drawn forcibly downwards by the action of the rods, *i i*, connecting them with the springs, *j*. In consequence of this arrangement, the springs are kept in a state of normal tension by the action of the weight of the stage and its load; and should the

rope break, its restraining power being suddenly removed, the springs act at a considerable mechanical advantage on the longer arms of the levers, while the shorter ones will be forced against the uprights, *f f*, with a force proportioned to the strength of the springs, *j*. The effect of the springs may be varied. The rods, *i*, extend upwards, and by means of ropes or chains, *k*, are attached to the supporting chain, *b*, and when so attached, the weight of the stages, *a*, is sufficient to overcome the pressure of the springs, *j*, and the stages ascend or descend without any pressure being exerted by the shorter ends of the levers, *g g*. Thus, in the event of a fracture of the chain or rope breaking, the shorter arms of a lever act as breaks to retard the downward progress of the mass. *l* is a break, and *m* a rope attached thereto to check the motion of the axis, *e*, when required.

In the drawing, the stage, A, is shown with its levers, *g*, free of the framing, *f*, and the stage, B, is shown with its levers, *g*, as would be the case when that end of the rope or chain, *v*, to which the stage, B, was attached, is broken.

The application of this apparatus to factories and warehouses, the great economy of time and of labour which it would promote, and the facilities it would almost everywhere afford for introducing an improved system of working in the subsidiary details of those large establishments, are obvious enough in many particulars, while it must be left for actual practice to develop its general advantage.

In the case of the construction of buildings, we have a numerical estimate of its advantages, as furnished from actual observation in the best examples of the present system, and the comparison made on very modest assumptions with regard to itself. Now, in practice it is found that for the first stage of scaffolding 1 labourer is supplied for every bricklayer, and that on the fifth stage 9 labourers are appointed to every 6 bricklayers. Supposing a labourer to work for 10 hours per day, and that he carries to the first scaffold 12 hods per hour, each hod containing 18 bricks, his day's work would amount to 2,160 bricks raised to the first stage. Now, in a system of labour conducted on Mr. Slade's plan, and with his apparatus, in which the men would go up and down with a certain number of bricks, each man would be at rest for 1 minute in the 5, an advantage which must be estimated on the supposition that he would raise on an average 3,020 more, making a man's day's work for the first scaffolding equal to 5,180. For the second scaffolding we must allow only 8 hods per hour, which gives 1,440 bricks; and allowing the same rest to each man, on Mr. Slade's system, he will raise 2,940 more, making his day's work amount to 4,380 for the second scaffold. For the third scaffolding we must allow 6 hods, or 1,080 bricks; and with the same rest, under Slade's system, for each man, he will raise 2,860 bricks, making his day's work 3,940. For the fourth scaffolding, we must assume that a man will raise 980 bricks; and adding 2,780 for the rest of Mr. Slade's man, the day's work for the fourth scaffolding is 3,760. In the fifth stage of scaffolding the labourer must be assumed to raise 882 bricks per day; and we must add 2,700 for the rest allowed to Slade's man, which makes the day's work for the fifth scaffold equal to 3,582. Finally, allowing 800 as a man's day's work for the sixth scaffolding, and adding 2,620 for Slade's labourer, the total for the man's day's work to the sixth scaffold would be 3,420.

We have, therefore, the following Tabular comparison of the number of bricks which can be raised by one man in one day, to each respective stage of scaffolding, from the first to the sixth inclusive, upon the present system, and that which would be introduced in practice with Slade's patent hoist; and these numbers, we are assured, leave a very large margin in Mr. Slade's favour:

	Under the present system.	Under Mr. Slade's.
1st stage	2,160	5,180
2nd ,,	1,440	4,380
3rd ,,	1,080	3,940
4th ,,	980	3,760
5th ,,	882	3,582
6th ,,	800	3,420
	7,342	24,262

Deducting 20 per cent. from the latter estimate, the comparison comes out in the proportion of 7,342 to 19,410 in favour of Mr. Slade's arrangement, or about 3 to 1. We feel assured that this, in conjunction with the numerous other advantages which would be incidental to it in practice, will ensure for it a welcome reception; and in that opinion we have thought it our duty to point out its great capabilities.

THE CALORIC ENGINE.

The following observations on the operation of Ericsson's caloric engine are from the pen of a practical man, and are worthy of consideration.

To the Editor of the Mechanics' Magazine.

Sir,—Much expectation having latterly been aroused by the numerous writings and lectures touching the Ericsson caloric engine, I beg to be permitted to address a few remarks to you upon the subject. I take this liberty from the circumstance of my having, upwards of twenty years since, turned my thoughts to the heating of air, in the view, principally, of obtaining a power where less fuel should be requisite than is the case to get a like power by the steam engine; and at which time also I pointed out theories and gave explanations which, to my mind, it is evident Captain Ericsson does not conceive.

The Ericsson caloric engine may thus be described:—There are one or two ovens, above which are one or two vessels containing atmospheric air, and to which a portion of the heat generated in the ovens is imparted; or, at least, as much of the heat as Captain Ericsson believes can be imparted or transferred. This expands the air, and leaves a power disposable to do work, which power the Captain supposes to be obtained simply by its expansion. He is wrong in this, as will be shown in explaining how he really gets his power; which explanation ought to lead him to a calculation indicating very nearly the result he would have from a well-arranged apparatus. He would then not be left at one time to conjecture that he would save half the fuel of the steam engine, and at other times that his furnaces could be fed with from a third to a twelfth part of the fuel that James Watt's engines consume.

About his cylinders, pistons, valves, beams, &c., there is nothing worthy of being named as different, or, at least, superior to what has been in use previously. As yet, therefore, we have no novelty; but we come to one in getting to his regenerator, which he believes must collect for him nearly all the heat of the expanded air which shall have done work. From what I have observed of the Captain, any idea he might form could not astonish me; but I certainly do feel it surprising that so many learned men should have occupied themselves with discussion upon such a subject, and not have found untruths in the caloric engine, or in its principles; although these are the least difficult to perceive, if we only look fully to the subject.

My opinion is, that the caloric engine is not, in any degree, better than others which have been proposed; and has certainly not the merit, in any one respect, of Sir George Cayley's engine. It is entirely dependent upon its regenerator for any extraordinary results, and consequently, if the principle upon which this is constructed prove to be erroneous, what becomes of its pretensions? If to apply heat to air be more advantageous than its application to fluids, then it is easy to show that the Captain has not, by far, fallen on the best way of managing the operation.

We have already spoken of the working cylinder; and before proceeding to the main point, I may farther say that, by the regenerator, there would be, if the Captain's theory were correct, a higher temperature than he has reported, if he had even no more available pressure at the commencement of the stroke, as he claims, than 12 lbs. on the inch. Thus he would soon have difficulty with his working piston; and he does not know how to help himself with high temperature. From the working cylinder, the air is passed to the regenerator, where, by a rapid movement through a number of metal gauzes, it is said, almost the whole heat of the air is transferred, and it is then passed into the atmosphere. Now here there must be some error. How can a large quantity of heat be transferred so rapidly to the small mass of metal constituting the gauzes? and what becomes of the principle that heat seeks an equable diffusion? Will the Captain say, or show, that the air he ejects has been nearly cooled down to the atmospheric temperature, while he has the gauze of a temperature of some hundred degrees?

This, although I notice it, does not, however, constitute the Captain's great error. He would, indeed, effect much if he saved anything like the proportion of heat he assures us of, even by his own imperfect notion of a caloric engine: but I do not hesitate to say that he is wrong on the point; nor do I, to point out that any heat he supposes he collects by his regenerator is an absolute loss to him. He has, in this, an expensive part of his apparatus which is useless, while a very considerable power is expended to work such a useless part.

It will, I must believe, be clear to most minds, that if a power be applied, no result greater than itself can be had from its application. But Captain Ericsson will have more; he passes through his regenerator external atmospheric air, which absorbs the heat imparted to the gauze by the air which had done the work. What is the profit of this? Heat is communicated to air, expanding it, but expanding it at a stage when only loss is the result, both directly

and indirectly; for no one would think of throwing away the hot air before extracting from it a portion of its caloric to be employed for some useful purpose. The Captain, as already said, has not only unnecessarily rendered his machine more complicated and expensive through his regenerator, but has created for himself a difficulty by having in his working cylinder a temperature which is likely to produce derangement. The principle of heating air before compressing and passing it into the oven, or heating-vessel, is erroneous, as is evident from the circumstance that, if a power be applied to compress it, that power will be the utmost that can, by possibility, be obtained. In defiance of this obvious truth, however, Ericsson not only heats, and thus expands his air before being compressed and heated in the heating-vessel, but assumes that he gains about eleven times the advantage that the steam engine gives.

The fact, I think, will shortly be decided to be as I have stated. Ericsson will obtain a saving of fuel by applying the caloric principle to airs or gases, instead of liquids; but he has shown a want of perception of physical laws in proposing what he has carried out. Instead of having the result, as regards fuel, compared with that of the steam engine, he must make his calculation on this other ground, that he compresses a given quantity of atmospheric air, which, when compressed and forced into the heating vessel, has artificial heat communicated to it, which addition of caloric increases the density or bulk of the air,—and the air so heated, in passing out to do work, will give him a power greater than that requisite to pass it into the heating-vessel. That power, added to the expansion, will yield him a result which, in theory, will widely differ, from say ten or twelve to one, compared with that of the steam engine, and lamentably differing from that he has reckoned upon.

My principal aim in making these observations is, to lead to a correct view of the caloric engine, which must, for a variety of purposes, be desirable; and you will oblige by giving insertion to them.

In the form of the engine I would suggest, I should, in certain cases, unite with my engine the air-engine, to get the greatest possible result. However, in doing so, it may safely be relied on that I should not in the least pretend that such wonders would be accomplished as have been announced.

I am, Sir, &c.,

ALEXANDER WILSON.

28, New Weston-street, Bermondsey.

THE UNITED KINGDOM ELECTRIC TELEGRAPH COMPANY.

In the innumerable requirements which the activity of modern commerce and domestic life have created, the extension of the electro-telegraphic system, while it serves as an index of their increasing magnitude, is an invaluable instrument for their effective accomplishment, and on that account an object to be desired by all classes of men. The announcement of a new Electric Telegraph Company, embracing so vast a field of action as the above title discloses, and proceeding upon a basis devised by so well-known and ingenious an electrician as Mr. Thomas Allan, is a circumstance, therefore, which we regard with cordial satisfaction, not only as tending to promote the general convenience, and to increase the comforts of the community, but as a new impulse to the cultivation of a branch of the physical sciences which has already done so much, and which promises still to open up new intellectual and practical means of action. The general object of the United Kingdom Telegraph Company, in the present era of electric telegraphs, is thus described in an article on the subject, which appeared in a recent number of the *Caledonian Mercury*:—"Its object is to meet the public wants, by keeping pace with the enterprise of the age—to insure the community a complete, comprehensive, and economical system of telegraphic communication throughout Great Britain and Ireland. In our day, perhaps, apart from railway communication, no institution has proved more beneficial than the uniform Penny postage. It is all-pervading in its operation, whether we look to the commercial or the social intercourse of the country. The promoters of the United Kingdom Telegraph Company, acting so far on the same principle, intend that the important agency at their command should be varied and extended in its application, and this can only be attained by efficiency in the system on the one side, and a tariff of charges adapted to the requirements of the million on the other."

In drawing attention to the great and beneficial reform it promises to produce in telegraphic communication, the prospectus refers, among other contemplated improvements, to an universal and uniform reduction of charge to 1*s*. per short message throughout the United Kingdom, irrespective of distance; or the same object may be gained by fixing the rate at a penny per word. If this system be vigorously carried out—and it is eminently practicable, looking to the resources of this company—we shall reproduce, in the telegraphic system, the

happy results which Rowland Hill's reform worked in the postal system, and meet with a striking illustration of the sound and vital principle on which our postal communication is based. The time was, and that not many years since, when the cost of a letter from London to Edinburgh was 1*s*. 1½*d*., and the time in transmission 48 hours. According to the above system, we are to have a message per the electric wire in 3 minutes, and at a charge of 1*s*.

In this undertaking there is one very important and original feature; viz., the proposition to rent, either to Government or to individuals, independent wires, to be used for the public service, of course, in the first case, and for private business transactions in the other. From the secresy and facility which this would afford to commercial communications, it will certainly be appreciated by many large mercantile firms having establishments in two or more places; as, for example, London and Liverpool, London and Manchester, Leeds, Glasgow, &c. The cost demanded by the Telegraph Company for this privilege, being only a rental of 2*l*. per mile a year, seems exceedingly moderate if estimated by the services rendered, and the magnitude of the transactions that might be thus instantaneously and secretly influenced. From the simplicity of the arrangements devised by this new company, this private telegraph can be easily carried into the merchants' counting-house, so that he and his clerks may communicate directly at all times, and with the most perfect secresy, to their various branches. We need scarcely say how important such a channel of communication might also become to bankers. It would, in some degree, resemble the extension of the speaking-tubes now used within their establishments to places at the distance of hundreds of miles, the operation in the one instance and the other being conducted with equal speed and certainty. That the commercial public will not be slow to take advantage of this simple and novel application of the telegraph, we may safely anticipate, for we will soon become as familiar with this mode of communication as we already are with that which the Post-office has afforded us.

As regards the progressive increase of the electro-telegraphic system, and that which it will probably achieve in the future, under the influence of a low tariff, and conducted on the principle of the penny postage, they will be seen from the tabular estimate given below. The operation of the principle will develop itself in a geometrical progression with the increase of the stations. As an illustration, if we suppose that each station sent on an average 50 messages per day to each other station, and at 1s. per message, and this amount of work could be overtaken in less than 2 hours; supposing also that from the low rates, the messages sent would average the above number—say for 10 hours a day, or at 50 messages every 2 hours, in all 250 messages per day—then, according to those assumptions, the gross result would be for the year, taking 12 stations—

1.	In 2 hours, 50 Messages.	In 4 hours, 100 Messages.	In 6 hours, 150 Messages.	In 8 hours, 200 Messages.	In 10 hours, 250 Messages.
2.	L.1,825	L.3,650	L.5,475	L.7,300	L.9,125
3.	5,475	10,950	16,425	21,900	27,375
4.	10,950	21,900	32,850	43,800	54,750
5.	18,250	36,500	54,750	73,000	91,250
6.	27,375	54,750	82,125	109,500	136,875
7.	38,325	76,650	114,975	153,300	191,625
8.	51,100	102,200	153,300	204,400	255,500
9.	65,700	131,400	197,100	262,800	328,500
10.	82,125	164,250	246,375	328,500	410,625
11.	100,375	200,750	301,125	401,500	501,875
12.	120,450	240,900	361,350	481,800	602,250

The vast field of operation of which these figures give us the assurance, strongly invite the co-operation of men of capital and influence; and we feel assured that the labours of the United Kingdom Electric Telegraph Company, guided by the intelligent directions of Mr. Allan, who, for years past, has devoted himself to the improvement of electro-telegraphic communication, in point of simplicity, certainty, and dispatch, and who has with eminent advantage altered the system of signalling,

the insulation of wires, and the generation of battery power, will be crowned with a rich harvest of success.

THE TRADES OF BIRMINGHAM.

THE gun-making still continues exceedingly brisk, and no small inducements have been ineffectually offered by gun-makers in other towns to draw off the men from this district. Their wages at the present time is, on the whole, much in accordance with their own proposals made last year; and being on good terms with their employers, few, if any, have responded to the terms held out to them to leave.

The general manufactures of Birmingham continue active, and employment in most descriptions of trade is abundant. Many of our principal manufacturers have been busily engaged in preparing articles of their production for the Dublin and New York Exhibitions, which will be of great beauty and utility. Messrs. Elkington, Mason, and Co., send to Dublin choice specimens of gold and silver,—each of them, like their bronzes, works of fine art manufacture; Messrs. Winfield, articles in ornamental brass and metallic bedsteads; Messrs. John Hardman and Co., those exquisite ecclesiastical productions which made the Mediæval Court a favourite rendezvous; Messrs. Mapplebeck and Lowe, agricultural implements; Messrs. Chance & Co., some gorgeous stained glass windows; beautiful *papier maché* works, from Jennens and Betteridge, and numerous other Birmingham manufacturers will add to the display from this town. The production of these articles has created considerable stir in some establishments, but the ordinary business of Birmingham is more than usually good. The summer trade in the lighter articles of Birmingham produce is very promising, and, now the price of metals is lower, there is little doubt that brass-founders, lamp-makers, and other trades, whose manufactures are most in use in winter, should present orders fail (of which, however, there does not seem to be any immediate prospect), will promptly set to work for stock, as, from present appearances they may do so with perfect safety.

The chandelier made by Mr. R. W. Winfield, of Cambridge-street, for Her Majesty, to which we have already adverted, is well deserving of notice. It has been made for the marine villa, at Osborne-house, and was forwarded a few nights ago. It is designed in the Italian style, and is composed of brass matted, and in part relieved by burnishing. The body of the chandelier depends from what is termed a jewelled shaft. It is vase-shaped, above which part, and around the shaft, are placed three elegantly-modelled figures in Parian, illustrative of Peace, Plenty, and Love. The body is decorated with marks of female faces, with closed eyes,—typical of night; and the whole presents a specimen of exquisite workmanship.

THE IRON TRADE.

THE iron trade is stated, by the *Birmingham Mercury* of Saturday morning, to be, as far as plates, sheets, and rails are concerned, extremely brisk, owing to the immense quantity required to complete the various railways in England and America, and also for shipbuilding purposes. Sales of iron are, however, more easily effected than they were two months ago. The pig-market, as in Scotland, is still dull, and transactions to any great extent cannot be accomplished; and this difficulty will increase if the large number of furnaces now at work are continued, as there will be a great falling off in labour at the mills and forges in the summer months. It is stated by one of the American trade reports "that there are now in progress, and in actual construction, in various places 20,000 miles of railway, which will consume 2,400,000 tons of iron—enough to occupy all the mills in the world now engaged in making railroad iron for years."

Glasgow Pig-Iron Market.—Glasgow, April 30.—Our pig-iron market has been much depressed during the past week, in consequence of a good deal of iron being forced for sale, several parties failing to meet their prompts. The stoppage of Mr. Attwood also exercised an injurious influence, and the price fell from 52s. on Monday to 49s. on Wednesday; since then, however, the pressure of iron for early cash being removed, matters have assumed a firmer aspect, and to-day the price of warrants is 50s. cash, rather buyers. No. 1 g.m.b., quoted 51s.; Gartsherrie, 54s. cash against bill of lading.

America.—By the screw steam-ship *Andes*, which arrived at Liverpool on Saturday with advices from New York to the 18th ult., we learn that Scotch pig-iron was selling at 54s. 6d., and rails at 8*l.* 7s. 6d., to 8*l.* 10s., according to quality. The *Europa* arrived on Sunday with advices two days later, but these did not alter the state of the iron-market as reported by the *Andes*.

SUBMARINE TELEGRAPH TO INDIA.

THE *Patrie* gives the following account of a project which has just been formed in

France, and which will probably be soon carried out, of connecting Algeria by a submarine line of telegraph with the French telegraphic system, and ultimately of extending the line to Alexandria and India.

It is announced that an important project, which has excited the interest of the Government of the Emperor, is about to be realised. It is stated that, after a serious study of the matter, a convention, in which the different Powers interested have taken part, has just been concluded for the establishment of an electrical communication which will unite the European Continent with Algeria by crossing the Islands of Corsica and Sardinia. The submarine telegraph which comes from England to France is to be continued by land; after crossing Nice and Genoa, will reach Spezzia at the bottom of the Gulf of that name. The new line will start from that point, and after crossing the Island of Corsica will pass by Sardinia to the coast of Algeria, near Bona. From that place, if it be thought necessary, it will be continued as far as the Regency of Tunis. The works necessary for the accomplishment of the first part of this plan will be completed in two years from the date of the promulgation of the law. At that time the line will be prolonged by the shore of the Mediterranean in Africa as far as Alexandria, in order from that point to reach India and Australia. Science and practice show that this plan, in spite of the serious difficulties which it presents, is principally realisable in the section which interests France. All its parts have been carefully surveyed, and the direction of the submarine line has been established according to the last chart. The cable will lie at the bottom of the sea; the Mediterranean, if a straight line had been followed from the Isles d'Hyères, near Toulon, to Cape Bourgaroni, on the coast of Algeria, would not have been practicable, as it has in its centre a depth from 2,000 to 3,000 metres; but the points chosen for crossing are much more favourable. From Spezzia to Cape Corse the *maximum* depth is only 220 metres; in the Strait of Bonifacio it is only 80; and from Cape Teulada, at the extremity of the Island of Sardinia, to Bona, on the coast of Africa, it is only 827. The average depth is much less considerable. From these *data* it will be seen that the operation is very practicable, and there is reason to hope that it will be crowned with complete success. It is stated that conventions have been entered into with the Government of the Sardinian States, with those of the Bey of Tunis and of the Pasha of Egypt, to secure the protection of the telegraphic wires and of the works. The plan which we have above analysed will, it is said, be shortly brought under the consideration of the legislative body. The surveys which will serve as the basis of that examination have already received the approbation of a commission, composed of special and competent men, to which they had been referred by order of the Government.

INSTITUTION OF CIVIL ENGINEERS.

Sitting of Tuesday, May 3.

The Chair was taken by James Simpson, Esq., Vice-President, and the paper read was "A Description of the Chesil Bank, Portland," by Mr. J. Coode, M. Inst. C.E.

The author, in his position of Resident Engineer of the Portland Breakwater Works, now in course of execution under Mr. J. M. Rendel, President Inst. C.E., had for a long time directed his attention to the extraordinary accumulation of shingle, called the Chesil Bank, one of the most remarkable features of the south-east coast of England. It consisted of a vast mound of shingle, in the form of a narrow isthmus, lying upon the western sea-board of Dorsetshire, between Abbotsbury and Portland; its length was 10½ miles, extending in a south-east direction, and its breadth at the base, or level of low water of ordinary springtides was 170 yards near Abbotsbury, and 200 yards at Portland. Along a portion of its course, south of Wyke, the bank acted as a natural breakwater to the anchorage of "Portland Roads," affording shelter from the westerly and south-west gales. The height increased from the north-west, but the inclination of the crest was not uniform throughout; the rise between Abbotsbury and Wyke being at the rate of 1 in 8,450, whilst that between Wyke and Portland was 1 in 880. In a transverse direction, one general slope appeared to exist, from the summit down to a depth of 3½ to 4½ fathoms below low water; the rate of inclination varying only from 1 in 5½ to 1 in 7. In the next depth of 2 fathoms, the slope was 1 in 8 to 1 in 11; outside this, the slope was about 1 in 30, to a depth varying from 6 to 8 fathoms, at which point the shingle ceased entirely, and was succeeded by fine sand.

It had been generally supposed, that the nucleus of the bank was formed of a mound of clay. Repeated trials by boring, had, however, shown that the bed on which the shingle rested, on the east, was the edge of the Kimmeridge clay of the East Bay; and it was only on that side that it could be

reached by boring-tools. The bank consisted in reality of shingle, mixed in places with sand, and so compact as to prevent the percolation of water, except during heavy gales from the south-west, notwithstanding that at certain times the tide rose nearly three feet higher on the west than on the east side of the bank, and in heavy gales the waves ran up the slope as much as ten feet vertically. The largest shingle was generally found "to leeward," or farthest from the point whence the heaviest seas proceeded; and so clearly was this defined, that a Portland fisherman was popularly said to be able to distinguish, in the darkest night, any precise spot of the beach "by the size of the pebbles." The shingle composing the bank consisted chiefly of chalk flints, with a small admixture of pebbles from other formations; and in an interesting geological examination of the coast, the author traced the principal supply of shingle to have been derived from the chalk cliffs to the westward, between Lyme and Sidmouth, and from the vicinity of Beer Head. Other shingle, of distinct character, proceeded from Budleigh Salterton, and other pebbles from Aylesbere-hill, inland, being brought down to the coast by the River Otter.

The question was next discussed as to the power by which shingle was conveyed from a distance of between 40 and 50 miles, and deposited in the form of a high mound. The action of tidal currents was carefully examined, and after admitting that they did sometimes modify the extent and form of accumulations of shingle; and referring to the late Mr. H. R. Palmer's paper "On the motion of Shingle Beaches," additional reasons were given against the sufficiency of this tidal action, to produce such results. Instances were then cited of shingle travelling in opposition to the prevailing current of tide, and having shown that the progress of the shingle could not be attributed to the action of the tidal currents, the effect of the wind-waves was attentively considered. The prevalence of west and south-west winds, on that coast, was demonstrated, from the observations made at Plymouth, with Whewell and Osler's anemometers, by Sir W. Snow Harris, for the British Association; and it was shown that lines drawn across the bay, in the direction of the heaviest and prevailing winds, would intersect the points, whence the shingle had evidently been derived. It was shown, also, that the seas driving along the west side of Portland sufficed to arrest the progress of the shingle, and the evidence adduced led irresistibly to the conclusion that the ultimate movement of shingle was always found to be in the direction of, and never against, the drift of the heaviest seas; but frequently in opposition to the prevailing tidal current. It appeared evident that neither the action of the stream at Abbotsbury, nor the flow of the tide in the Fleet, could have moved the mass, or piled up the mound of shingle composing the bank. The sudden depth of eight fathoms of water, at a cable's length from the shore, was a peculiar feature, and permitted the heaviest seas to fall in with great violence, and without the retardation and loss of force usually experienced on long-shelving beaches.

Evidence was then adduced that shingle was moved at a much greater depth than was usually supposed. The author, in his researches, found that at one time the pebbles, down to the edge of the sand, were incrusted with barnacles, *balanus balanoides*, and subsequently, after a continuance of heavy gales from the south-west, the shingle, down to the lowest point, was found to be completely freed from incrustation; demonstrating that there had been considerable motion of the pebbles, at a depth of eight fathoms below low water of spring tides. The formation of the gullies, or "cans," in the face of the bank, caused by the partial percolation, was noticed, as tending in some degree to produce the flat slope on the east side. The author considered the cause of the largest shingle being found to "leeward" was, that large pebbles were more easily moved than those of small size, inasmuch as the former were generally of exceptional dimensions, were usually found on the surface, and offered nearly the whole of their surface to the action of the waves; whereas the latter, forming the bulk of the mass, were more uniform in size, were closely embedded together, and exposed little more than their upper surfaces, over which the waves had a tendency to travel, rather than to lift them from their bed. Thus the larger stones were rolled about by every wave, whilst the small pebbles were only moved in a mass, and received their abrasion whilst settling down again to form the even, uniform surface of the beach.

Specimens were exhibited of shingle obtained from below the low-water mark, by means of dredging and diving, in order to demonstrate, by the character and form of the pebbles, the passage of the shingle from west to east; and referring to remarks made by the author, at a previous meeting of the Institution, it was contended that the present specimens confirmed the opinion then given,—that the smallest pebbles were generally found at the top of the Chesil Bank. The opinion expressed by the majority of the speakers at that meeting was just the reverse, and the error most

probably arose from comparing the Chesil Bank with the case of a beach terminating against a cliff or a wall about the level of high water. In such a case (and then only after the prevalence of off-shore winds) the largest shingle would be found at the level of the previous high water, and therefore at the top. This, however, would not be the case upon the Chesil Bank, or upon any other beach similarly situated, where the shingle was free to assume a sectional form, unaffected by the recoil of the water striking against a vertical or nearly vertical face. After a heavy gale and a ground swell, the large shingle was entirely scoured away. The small shingle was thrown up to the crest or top of the bank during the height of heavy gales, out of the reach of ordinary waves, or the clawing action of receding water. By sections of the profile of the bank, taken after a heavy gale from the south-west, at right angles to the direction of the bank, the general form was shown to be nearly that of a true parabola; with the axis inclined to a level line, to the extent of 1 foot in 90 feet. Mr. Palmer's views as to the "accumulative" and the "destructive" action of waves, were then examined, the author's observations inducing him to fix other limits; the rule, so far as one could be formed, being in his opinion, that seven, or any less number of waves per minute, induce the "destructive" action, and nine, or any greater number, in the same time, the "accumulative" action; it being admitted that shingle always accumulated with off-shore winds, and was scoured off during on-shore winds, and especially by the subsequent ground swell; bearing in mind, however, in watching the course of the crest of the wave, after breaking, that if it fell upon the water of the preceding wave, then returning down the slope of the beach (as was the case when the waves followed in quick succession), the "accumulative" action was going on; but if the water descended directly on the pebbles (as when the waves broke at longer intervals), the "destructive" action was progressing. The rapidity with which the water ran off or was absorbed, would influence the result, and that was to some extent contingent on the slope of the beach, and also on the nature and degree of compactness of the material of which it was composed.

The paper concluded with some instances of the effects produced on the Chesil Bank by heavy gales from the south-west, and it was stated that on such occasions it was not an uncommon occurrence (when the advancing wave met the receding water of the wave immediately preceding it) to see an enormous mass of broken water and spray rise vertically to the height of 60 or 70 feet. This force had on several occasions crushed inwards the decks of vessels stranded on the beach.

During the gale of the 27th of December, 1852, the quantity of shingle scoured away between Abbotsbury and Portland, was 3,763,300 tons; and the quantity thrown in within the next eighteen days was 2,672,500 tons. On the 23rd of November, 1852, a heavy ground swell, consequent on half a gale of only four hours' duration from the south-west, scoured away within eighteen hours 4,553,000 tons, and in five days afterwards 3,554,200 tons of shingle were found to have been thrown in again. These quantities were derived from careful admeasurement of the profile of the bank.

The paper was illustrated by a large series of diagrams of the sectional profiles of the bank and the outlines of the shores, exhibiting the geological features of the coast, with the bearings of the prevalent winds, &c., together with a collection of specimens of the shingle, taken at four different points along the bank, and at various levels, from the top down to a depth of eight fathoms below low-water of spring tides.

It was announced that the discussion on the paper would be renewed at the meeting of Tuesday, May 10th, when, if time permitted, the following papers would be read, "On the Conversion of Heat into Mechanical Effect," by Mr. C. W. Siemens; "On Stirling's Air-engine," by Mr. J. Leslie, M. Inst. C.E.; and "On the Caloric Engine," by Mr. C. Manby, M. Inst. C.E.

At the monthly ballot, the following candidates were duly elected:—Mr. H. F. Mackworth, as a member; Messrs. J. Forbes, J. N. Gildea, H. P. Stephenson, and Lieutenant H. W. Tyler, R. E., as associates.

ROSE'S PATENT LOCK.

(Patent dated October 21, 1852.)

The improvements in the construction of locks patented by Mr. Rose, are represented in the accompanying figures, and have in view the absolute protection of the instrument from being picked.

Fig. 1 represents a lock as constructed by the patentee. A is the case, and B the tumblers, at the back or top of which are the springs, C, one of which is applied to every tumbler. The pin, *a*, upon which the back ends of the tumblers work, is inserted into the short arm of a bell-crank lever, D, the fulcrum of which is fitted to the frame

or case, A, of the lock, and immediately above the pin, *a*. The long arm of the lever is prolonged parallel with the bolt, E, and terminates in a projecting piece, *b*, corresponding with the notch, *c*, made in the top of the bolt, E. In consequence of this arrangement, upon any attempt being made to force back the bolt of the lock, the short arm of the bell-crank lever would be carried back, and the tumblers with it, while the long arm, with its projecting piece, would be brought down into the notch in the bolt, as shown in fig. 2, and effectually prevent the effort from being effective. On the pressure being withdrawn from the bolt, the parts would resume their original position, as in fig. 1.

Fig. 3 represents a separate view of the bolt, E, and bell-crank lever, D, showing their positions in respect to each other.

Fig. 1.

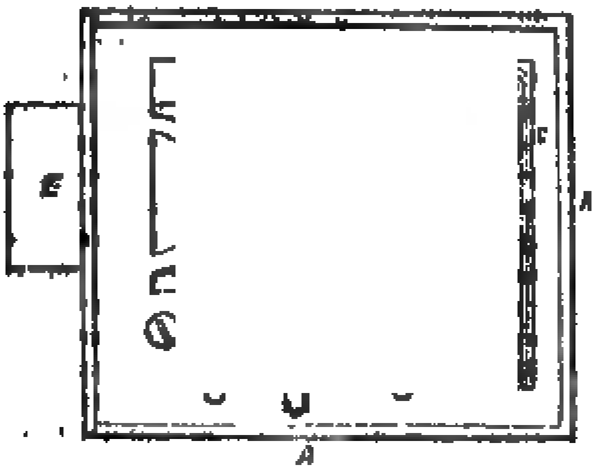
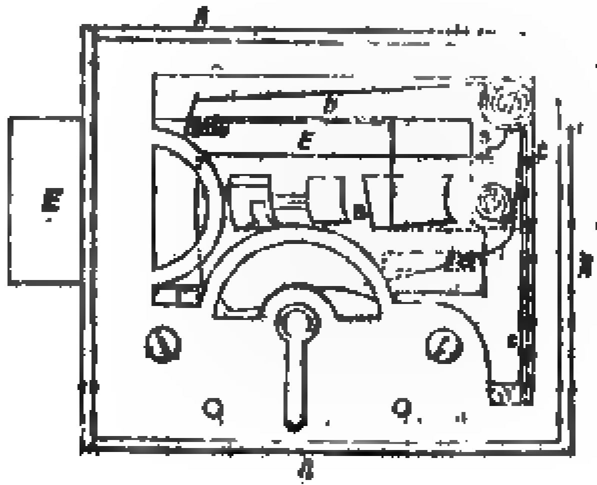


Fig. 2.



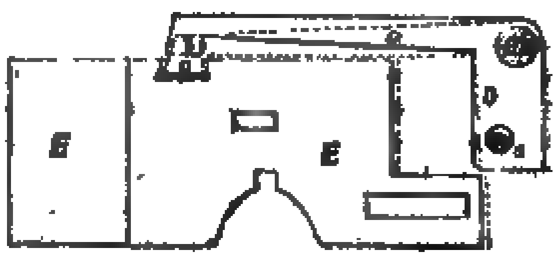


Fig. 3.

PETRIE'S PATENT SULPHURIC-ACID PROCESS.

The main feature of this invention consists in carrying on all the processes as much as possible on the differential principle, which may be briefly described as conducting the chemical changes, or other processes, by a gradually varying action along a line of motion, in which the two things concerned in the change,—whether gases, liquids, or heat,—are made to pass through one another in opposite directions, and the change is effected by imperceptibly small differences at each successive point, until the two things emerge at opposite ends of the line of action in a completely different condition. The name of this system of action is suggested by analogy to that most powerful instrument of modern analysis, the differential calculus;—an integral result perfectly developed by the progressive action and germination of indefinitely small differences along an axis or abscissa.

Changes are thus effected on the differential principle with admirable perfection and economy, quite unattainable by the more ordinary modes of bringing two materials or powers to act on one another. It is only lately that the value of this principle has been properly appreciated, and the wideness of its application in the arts recognised. The most notable practical application of it, and one which bids fair soon to become of the highest importance, was by Mr. Stirling, in his differential air-engine, which, by this principle, worked with a truly astonishing economy of fuel, even in its first practical application, many years ago, and upon which Mr. Ericsson has, with much zeal, lately endeavoured to improve. The same principle has recently been applied, under patent, with great

success, to the obtaining pharmaceutical and other extracts of unrivalled strength and purity, and with the most complete economy of material.

In the present invention, this principle is applied to the various processes in the manufacture of sulphuric acid, both in burning the sulphurous matter, cooling the gases, oxidizing the fumes, condensing them, and concentrating and cooling the acid. The following are the principal novelties involved in Mr. Petrie's process. First, a mode of securing a continuous and uniform combustion, and a spontaneous feeding of the furnace through an inclined grating,—against one side of which lies the stock of sulphur, and on the other side of which the heat circulates and melts the sulphur, while the rate of feeding thus obtained is regulated at pleasure by a damper which diverts the heat from the grating. Secondly, an arrangement for causing the ash to be spontaneously deposited conveniently for removal, and away from the part where the combustion chiefly goes on. Thirdly, an arrangement of air-flues beneath, to cool the parts of the furnace where sublimation may be feared, and to aid the combustion in the ash by increased heat. Fourthly, a new furnace, of a columnar form, for burning the infusible forms of sulphureous matter, on the differential principle, with provision for cooling and removing the residuum continuously, as it is produced, without interrupting the combustion.

In addition to these, the following objects have been simultaneously effected: Improvements in the construction of what the inventor terms "Draught cells," for oxidizing and condensing the sulphurous fumes, instead of the usual leaden chambers. The forms in which they have been hitherto used, under the names of "Coke apparatus," or "Gravel apparatus," he regards as being extremely imperfect and inefficient. He now gives rules relating to the best size and form of the loose matter to be so used, and the proper choice of solid and porous matter,—as quartz, flint, pebbles, and pumice or coke, according to the different nature of the changes to be effected. He also points out the necessity of attention to passing the liquids and gases in opposite directions through the draught cell, in order to obtain the economy and completeness due to differential action. He obtains an equable percolation of liquid from the top by the action of a species of drip-stone, having a flat bottom, notched out like a wafer stamp; and also by an arrangement of self-acting hydraulic rockers for distributing the liquid by intermittent flushes, and in a diffused manner, far more effectively than by the usual means of a syphon. Another point, of some importance in this manufacture, is, that he dispenses with the grating or supports hitherto generally needed to admit the draught, under the mass of porous matter, besides some minor improvements of construction. The patent also includes improved modes of using the draught cells, whereby the oxidation is performed without nitre or nitric-acid, and, more rapidly, with an unusually small amount of nitric-acid; and arrangements for working the draught-cells, so that the entire course of manufacture is performed at once. By these the fumes are absorbed, oxidized into sulphuric-acid, concentrated and clarified, and the sulphuric vapour arising from concentration, condensed and re-concentrated, and the products cooled, ready for sale, in one and the same process. The process of concentration, however, is not claimed, as the patentee considers it due to Mr. Gossage.

The application of improved means of obtaining a powerful draught or suction of air through the draught-cells, by the application of a known apparatus for producing a draught by the falling of broken water or spray down a vertical shaft, and also by hydraulic air-holders; and the employment of an apparatus which the patentee calls a stereo-oxidator, in which an extensive surface of certain solid matters, platinum being preferred, is obtained with the least possible substance, are characteristic features in this form of arrangement. The apparatus is claimed in combination with a double furnace,—a draught power; a means of bringing the gases to a certain temperature necessary to the action of the stereo-oxidator, in passing through which, the conversion of sulphurous into the strongest forms of sulphuric acid, is suddenly and continuously effected without nitre or liquid, and a condenser, on the construction of the improved draught-cell, which delivers the product.

A Practical Treatise on the Manufacture and Distribution of Coal-gas. Illustrated by Engravings from Working - drawings, with general Estimates. By SAMUEL CLEGG, Jun., M.I.C.E., F.G.S. Second Edition. John Weale.

THE history of human progress must be at all times a subject of vast importance. It is astonishing with what readiness every existing generation has taken possession of its inheritance, without much inquiry as to its origin. We, the present habitants of a country abounding in appliances, for the

most part artificial,—a country so geographically situate, as to supply the stimulus of climatic deficiencies to the ordinary forward tendency of gregarious humanity,—scarcely appreciate the vast amount of human thought to which we are indebted for the lengthened day and regulated temperature with which, in spite of a high latitude, and a singularly variable climate, we have somehow invested ourselves. It is true that no Englishman is ignorant of the fact, that he is mainly indebted to an abundant supply of a certain mineral deposit for this amelioration of his otherwise very uncomfortable condition. It is not quite so certain, however, that Englishmen are generally aware that coal-fields are distributed with a tolerably equal hand over the whole surface of the globe.

The use of mineral coal, as fuel, is of some antiquity amongst us. The gradual application of this material to operations in which an elevated temperature was necessary, its substitution for wood or vegetable fuel, as this latter became scarce, its introduction in metallurgic manufactures, in the stupendous mechanical operations of vaporised water, &c. &c.,—these are amongst the chronicled and well-understood agencies of coal in the staples of our country, and it is sufficiently intelligible to all who may have enjoyed the genial comfort of a sea-coal fire. But it was reserved for our own times to witness another application of this invaluable geological treasure. Coal had given us heat; it was now called upon to give us light also.

Let all praise be given to those observing and intelligent men who knew how to answer this demand. Forty years have not yet passed since it was answered. The problem was new in all its features. Pneumatic chemistry had scarcely an existence; the habitudes of gaseous bodies were such as almost to elude the grasp of the operator. Coal had hitherto been dealt with in open fire-places; its volatile contents had passed into the atmosphere, and were disregarded. These fugitive products were now to be retained, held in store, distributed here and there at will, and weighed, measured, analysed, and estimated,—in fact, to be matched as an article of purchase and sale, with a pound of candles. All this was indispensable to the safe investment of capital in the manufacture of gas for illumination from coal. Numerous and difficult as were these requirements, they were all so far met as to render lighting by gas one of the most lucrative speculations of the day, while its advantages in a public point of view never admitted of the slightest doubt. Manifold were the difficulties which stood in the path of the first experimenters in this new pursuit, and amongst those who strove perseveringly for years to carry it to a successful issue, no name stands so high as that of Samuel Clegg. The impress of his genius is still visible upon every gas-making and gas-meting apparatus, and we are led to these remarks upon this interesting subject by the appearance of the second edition of his son's much-prized work.

We have, in our preceding observations, taken some notice of what had to be done by those whose task was the establishment of coal-gas-lighting, as a commercial enterprise. This was effected with a rapidity altogether unprecedented, and in a very great degree through the sagacity and perseverance of Mr. Clegg, sen.; and we cannot but express our satisfaction at the re-appearance of a work on gas-lighting from the pen of another Samuel Clegg, in which the present state of the art of gas-lighting is most elaborately treated on. Recollecting, as we do, the first impression of this startling discovery, and the admiration with which we first studied the inventive genius displayed in the various arrangements essential to its application, we must allow that nothing in its later progress has occurred to lessen our estimation of those early efforts, or to recognize any very material correction, as might have been anticipated, of errors likely enough to be involved in processes perfectly original. Chemical views of the subject have not changed. Modifications of manipulation have been introduced, improved forms of apparatus, a better appreciation of material, a more rigid economy, and a much more perfect knowledge of the endless combinations of the elements, carbon and hydrogen, are all borne ample testimony to in Mr. Clegg's book; but notwithstanding, gas-making is now what it was forty years ago, if we allow for the bit-by-bit, rule-of-thumb results of experience. That this experience is of the highest value, is shown by the comparison of the price of gas at this day and the price it bore thirty years ago. We are merely saying that gas-making has not improved in any very sensible degree. No revolution of practice has taken place. The thing is better understood, and better profits are attainable from a narrower margin; and that is all.

Mr. Clegg has treated his subject as a commercial one, and we think his book may be referred to with perfect confidence. He carefully lays before his reader all that is doing, and all that has been done. He examines the various materials which the gas-maker may have to deal with, and affixes a comparative value to each. He is equally copious and minute in his descriptions of the various apparatus, as well for

the manufacture, purification, and measurement of gas, as for its distribution and economical consumption. In a word, he has left nothing unexplained, and, for the convenience of the gas-engineer, he has carefully tabulated all the facts which are susceptible of that very convenient mode of treatment. The illustrations are abundant, practically exact, and of the first order in point of artistic execution. Upon full consideration, therefore, we have no hesitation in saying that the art of coal-gas-lighting, as it is now practised, is presented to the reader of Mr. Clegg's treatise in as lucid and compendious a form as can possibly be given to a subject of so complex a character —a subject, too, which unites for a common purpose so many portions of physical science, and upon the correct application of each and all of which the success of the operator must depend.

RECENT PERFORMANCES OF THE "BENGAL."

The Peninsular and Oriental Steam Navigation Company's ship *Bengal*, Captain H. W. Powell, arrived at Southampton on Monday morning, bringing the heavy portion of the East India, China, and Mediterranean mails.

It appears that on her homeward passage she experienced from Malta to off Oporto a succession of strong head-winds, or she would have arrived early on Sunday. On the 24th ult., while crossing the Gulf of Lyons, she met with a strong N.W. gale, with a heavy cross sea, through which she steamed 9 and 10 knots. From Oporto to Finisterre she had a fresh gale and thick weather from S.S.E., and across the Bay light variable winds. She is found to steam against a fresh head-wind 10 knots, in smooth water with no wind, 11½ and 12 knots; with her fore and aft canvas she goes 12 and 13, and with all sail set, and a fresh breeze, she goes 14 and 15½ knots. Her greatest run in 24 consecutive hours was 336 knots, giving an average of 14 knots an hour; the latter, we believe, nearly equalling the greatest run ever accomplished by an ocean-going steamer. During this last passage she has not had six consecutive hours of fair wind, so that her steaming qualities have been well and satisfactorily proved. Her run from Malta to Alexandria, 830 miles, was accomplished in 70 hours, and back to Malta in 72 hours. Coming up Channel, fresh easterly winds prevailed, the sailing-vessels beating up, being under double-reefed topsails.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MAY 5, 1853.

William Edward Newton, of Chancery-lane, Middlesex. *For improvements in steam and other gauges.* (A communication.) Patent dated October 11, 1852.

The patentee describes and claims an arrangement of apparatus for indicating the pressure of steam and fluids. It consists of a corrugated plate or diaphragm of steel fitted in a chamber, to which the steam or liquid whose pressure is to be indicated is admitted. The steam acts against one side of the diaphragm, and the other side is furnished with a rod or lever in connection with the machinery of an index or dial, the hands of which are moved by the deflection of the diaphragm produced by the pressure exerted against it. When the pressure is removed from the diaphragm, the hands of the dial return at once to zero, the elasticity of the diaphragm being sufficient to bring it back to its original position. The return of the hands is aided by a coiled spring acting against the axis on which they are mounted. The same arrangement may also be employed as a vacuum gauge.

John Field, of Warnford-court, Throgmorton-street. *For improvements in transferring and printing.* (A communication.) Patent dated October 14, 1852.

This invention consists in transferring designs to, and producing surfaces suitable for printing from, by the employment of bitumen, or other material capable of being dissolved in ether or other solvent, and then rendered insoluble by exposure to light.

In carrying the invention into effect, the inventor takes a lithographic stone or zinc plate, and covers its surface with a thin film of bitumen (by preference that obtained from Judæa), dissolved in ether, or with some other preparation fulfilling the conditions before mentioned. This operation, is of course to be performed without exposure to light. He then lays on the prepared surface a photographic negative picture, and having covered it with a plate of glass, exposes it to the action of the light of the sun, when the parts of the surface left uncovered by the dark portions of the photograph will be acted on by the light, and the film of bitumen thereon rendered insoluble, whilst the film on those parts which are protected from the light will not be affected, and may be washed off by means of the solvent used, leaving the plate or stone in fit condition for use. Or it may be further treated, preparatory to printing, by applying acid to bite out the exposed portions, or by etching, or other desirable process.

Claim.—The combined processes of transferring and printing.

THOMAS CARTER, of Padstow, Cornwall, ship-builder. *For improvements in propelling.* Patent dated October 14, 1852.

This invention consists of an improved construction of direct-action submerged propeller, a description of which will be given in a future Number.

WALTER RICARDO, of the firm of A. and W. Ricardo, of London, share-broker. *For improvements in gas-burners.* (A communication.) Patent dated October 14, 1852.

Claims.—1. The manufacturing of gas-burners with two or more parallel slits at their ends or tops, so that the gas may issue through them in parallel sheets, or flat streams.

2. The manufacturing of gas-burners with two or more slits at their ends or tops, so inclined towards each other that the issuing sheets or flat streams of gas may converge and meet together, forming a single flame.

RICHARD ARCHIBALD BROOMAN, of the firm of J. C. Robertson and Co, of 166, Fleet-street, London, patent agents. *For improvements in mowing, cutting, and reaping machines.* (A communication.) Patent dated October 14, 1852.

These improvements consist in certain additions to, and modifications of, the American reaping-machine, for which former letters patent were granted to Mr. Brooman (on behalf of the inventor, Mr. M'Cormick,) the 7th December, 1850. A full description of the machine appeared in our pages at the time the former specification was enrolled (see vol. liv., p. 481), and the scope of the present improvements will be readily seen from the claims now made, which are as follows:

1. An improved form of finger.
2. The placing shoes or supports at different intervals along the underside of the finger-beam.
3. A peculiar form of finger-beam.
4. A double-edged cutter.
5. The delivery of grain by means of an apparatus so arranged as to deliver the grain to the side.
6. The inclination of the platform, or of the bars from one side to the other, so as to facilitate the delivery of the grain.
7. An improved scraper-board.
8. Certain methods of raising and lowering the wheels which carry the machine.

WILLIAM BROWN, of Heaton, near Bradford, York, mechanist. *For certain improvements in machinery or apparatus for preparing and spinning wool, hair, flax, silk, and all other fibrous materials.* Patent dated October 18, 1852.

The improvements claimed by Mr. Brown in relation to preparing machinery, consist principally in certain new arrangements of the heckles and combs, with their holders, and in an improved form of comb tooth.

The improvements in spinning machinery consist of a novel arrangement of stop-motion.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in machinery or apparatus applicable to public carriages, for ascertaining and registering the number of passengers who have travelled therein during a given period, and the distance each passenger has travelled.* (A communication.) Patent dated October 19, 1852.

In this improved registering apparatus the indications both as to number of passengers and distance travelled are produced by means of a pencil or marker for each seat in the conveyance, acting against the surface of a strip of paper, which is moved along by means of clock-work. The pencils are actuated by means of levers and connecting-rods, which receive motion from the seats, and the character of the lines marked on the paper shows whether the seats have been occupied or otherwise during a given period, the clock-work being, of course, arranged so as to move the paper forward at a stated rate of progression. During the time the seats are unoccupied, a wavy or zigzag line will be drawn by each pencil; but when the seats are depressed by passengers sitting down, a vertical stroke will be produced, and during the time of their occupation, a horizontal line; the zig-zag being again returned to when the seats are quitted.

The claims are for the general arrangement of the apparatus acting as described, and the arrangements by which the several required actions are produced.

WILLIAM EDWARD NEWTON, of Chancery-lane, civil engineer. *For improvements in machinery or apparatus for sewing.* (A communication.) Patent dated October 19, 1852.

The machinery claimed under this patent is intended for performing the operation of sewing by means of a double-looped stitch. There are two needles employed for this purpose, one of which works vertically and the other horizontally; each needle carries a separate thread, which are looped into each other alternately, the cloth or material to be sewn being fed forward under the vertical needle. The machinery comprehends also an arrangement for keeping the sewing-threads at a proper tension, as they come from the spools or bobbins on which they are wound.

ALFRED VINCENT NEWTON, of Chancery-lane, mechanical draughtsman. *For an improved mode of manufacturing railway*

chairs. (A communication.) Patent dated October 19, 1852.

This improved mode of manufacturing railway chairs consists in rolling them in continuous lengths from bars or narrow plates of wrought iron, and then cutting these lengths into separate chairs. The bars or plates are bent in at the edges by a preliminary process of rolling. previous to submitting them to the final operation, in performing which a mandril or equivalent contrivance is employed to prevent the lips of the chairs being too much bent in; the mandril should be of a somewhat similar form to that of the rail with which the chairs rolled on it are intended to be used.

Claim.—The rolling of railway chairs on a mandril or other equivalent contrivance in continuous lengths.

JOSEPH PALIN, of Liverpool, wholesale druggist, and Robert William Sievier, of Upper Holloway. *For improvements in brewing; and also in the production of extracts or infusions for other purposes.* Patent dated October 19, 1852.

The patentees describe and claim,

1. An improvement in brewing, by obtaining extracts from malt by means of previously made infusions or extracts from hops.

2. A mode of obtaining extracts from malt and hops by means of a suitable solvent when the operation is conducted in a vacuum. This process is also applicable to the making of extracts and infusions for general purposes.

3. A mode of treating extracts of malt and hops under a pressure of air greater than that of the atmosphere, by which means the aroma or volatile principle of the matters under operation is preserved.

4. An apparatus for cooling worts without exposure to the air, wherein a refrigerating surface is employed as a cover to the vessel.

5. A mode of obtaining extracts for brewing and pharmaceutical purposes, by causing fluids to circulate through the materials by the application of heat, the fluid being heated in a vessel detached from that in which the extract is being made.

EDWARD BRAILSFORD BRIGHT, of Liverpool, Secretary to the English and Irish Magnetic Telegraph Company, and CHARLES TILSTON BRIGHT, of Manchester, telegraph engineer. *For improvements in making telegraphic communications and in instruments and apparatus employed therein, and connected therewith.* Patent dated October 21, 1852.

The patentees claim with reference to their *First* improvement; Firstly.—The application of a third axle, and a T-piece or other mechanical locking apparatus, in order to obtain the dead beat right and left motion of an indicating needle or pointer, in conjunction with a single conducting wire. Secondly, The application of a magnet or magnets to an electro-magnetic coil or coils, using the force of repulsion, derived from a current of electricity polarizing such coil, to move the magnet away, and the attractive force exercised by the soft iron of the coil on the magnet when the electricity is withdrawn to bring such magnet back to its original position, and this may be combined with an auxiliary coil or coils exercising attraction upon the other pole of such magnet, which auxiliary coil or coils may, by arrangement of power, either have cores of iron or not, as may be most desirable from the nature of the circuit in which the apparatus is being used.

With reference to their *Second* improvement,—Firstly, The use of marine glue in combination with wood or other suitable basis, and of metal clamps or fastenings, coated with gutta percha, for above-ground insulation at or about the points of support. Secondly, The use of a sharp edge or ridge, upon which moisture will not remain, such edge being interposed between the wire and the post or ground, the wire not resting upon such edge.—Thirdly, The suspending above-ground wires, where a series is used, in such manner that no wire shall hang at any point perpendicularly above another.—Fourthly, The various means described of suspending, fastening, and shackling above-ground telegraph wires.

With reference to their *Third* and *Fourth* improvements.—Firstly, The insulating subterranean wires by placing wires between boards as described.—Secondly, The interposition of a flexible washer, when under ground or submarine wires are protected by a riband of metal wound so that each turn of the metal band overlaps the preceding turn, placed between the overlap and preceding turn.

With reference to their *Fifth* improvement.—The transmission of electrical currents of either kind, in either direction through the same wire, serving as a conductor, in broken lengths of railways, of electricity as described between two or more telegraph instruments.—[*Note.* They are aware that instruments have been constructed whereby relays of electricity can be passed in *one* direction and of *one* kind, but their invention consists in apparatus whereby both positive and negative currents can be passed consecutively, at will, both ways on one wire.]

With reference to their *Sixth* improvement, A peculiar method described of turning instruments into or out of circuit, to be used in connection with any decircuiter apparatus; and especially the mode of turn-

ing a telegraph instrument or instruments out of circuit, or into circuit from a distant station, by the employment of a certain series of simultaneous signals upon *more than one* telegraph instrument.

With reference to their *Seventh* improvement, A means of ascertaining the point of any fault in the conducting wire or wires from a distant station, without the necessity of proceeding to, or near to the faulty spot.

With reference to their *Eighth* and *Ninth* improvements, The standard galvanometer and various lightning protectors described.

With reference to their *Tenth* improvement.—Firstly, The use of apparatus whereby for every movement of the handle, lever, key, or other arrangement, including return to original position, only one current of magneto-electricity is passed from the induction coils of magnetic sending apparatus to the conducting wire, so as to allow of either the positive or negative current being made use of separately at will on one conducting wire, enabling thereby signals to be forwarded on a single wire, equivalent to those attainable by the pole changer of a voltaic series; such result being gained either by putting the induction coils upon short circuit, or by breaking the connection between them, or between either of them and the conducting wire or the earth during a portion of the movement of such handle, lever, key, &c., in order to prevent *one* of the two currents created by the backward and forward movement of such handle, &c., from passing to the receiving-apparatus, thereby obtaining in needle telegraphs a right and left motion of a pointer upon a single wire; and the same is applicable to various descriptions of telegraphs.—Secondly, A non-reciprocating circuit completer, whereby the current of electricity used in communicating signals to a distant station is not passed through the coils of the indicating portion of the sending apparatus.—Thirdly, The application of magnetic currents to printing telegraphs.

With reference to their *Eleventh* improvement, The use of fixed type in a stationary frame, whether circular or otherwise, in combination with letter printing telegraphs.

With reference to their *Twelfth* improvement, The putting a pressure on surface of mercury in order to produce a better metallic contact, as described, than hitherto obtained when mercury has been used in completing circuits for telegraphic purposes.

With reference to their *Thirteenth* improvement, A centrifugal alarm-apparatus as described. And

With reference to their *Fourteenth* improvement, The winding of wire on a coil in the manner described.

PROVISIONAL PROTECTIONS.

Dated February 24, 1853.

468. Charles Flude. Improvements in the production of spirit, and in the stills and apparatus employed therein.

Dated April 1, 1853.

778. John Smedley. Improvements in machinery or apparatus for opening, cleaning, blowing, or scutching animal wool, cotton, or other fibrous substances or materials.

Dated April 5, 1853.

811. Edmond Stanley Stanley. An improvement in the manufacture of soda-ash or carbonate of soda from common salt. A communication.

Dated April 13, 1853.

885. Alexander Edward Dudley Knox Archer. Improvements in apparatus for applying metallic capsules.

887. George Elliott and William Russell. Improvements in the manufacture of alkali.

889. Thomas Edwards. Improvements in steam engines.

891. Douglas Hebson. Improvements in working the air pumps of steam engines.

893. William Renwick Bowditch. Improvements in purifying water.

895. Charles Clifford. Improvements in apparatus for lowering boats evenly, and preventing them filling with water.

Dated April 14, 1853.

896. John Hinks and George Wells. An improvement or improvements in certain kinds of boxes.

897. Thomas Lovell Preston. An improvement or improvements in cutting out and piercing metals.

899. Constant Jouffroy Dumâry. Improvements in the manufacture of paste and enamel buttons.

900. Charles Lowe. Improvements in mills for grinding wheat and other grain.

901. John Chadwick and Thomas Dickins. Improvements in the production of raw and thrown silk.

902. John Bethell. Improvements in the manufacture of flax.

903. William Laycock. Improvements in the manufacture of metallic and other casks and vessels.

904. Joseph Adamson. Improvements in flushing-apparatus and in water-closets.

907. Alfred Guy. An improved filter.

908. Charles Green and James Newman. Improvements in the manufacture of wheels.

909. Robert Wyburn. Improvements in the construction of easy chairs.

910. William Ogden. A certain improvement or improvements applicable to carding-engines used for carding cotton, wool, and other fibrous materials.

911. William John Thomas Jones. Improvements in steam-engine governors.

912. David Zenner. Improvements in the treatment of ores and other substances containing metals, to obtain products therefrom, and the apparatus used therein.

913. Alexander Crichton. Improvements in the fitting of bilge pumps and injection cocks of iron steamers and sailing vessels.

914. François Marie Antoine Serruys. Improvements in tanning. A communication from Herman de Bock, of Bruges.

915. Jean Baptiste Marquet. Certain improvements in machinery or apparatus for winding, cleaning, doubling, twisting, and spinning silk,

cotton, wool, flax, hemp, and other filamentous materials.

916. George Titterton. Improvements in brushes.

Dated April 15, 1853.

917. William Wilkinson. An improvement or improvements in ropes, cords, lines, twines, and mill-bandings.

918. William Allen and William Murrell. Improvements in the mode or modes of cleansing bottles or other similar articles.

919. John Lewthwaite. Improvements in rollers or mountings for blinds, maps, and other like articles.

920. William Edward Newton. Improvements in treating refuse silk waste, and in converting it into a valuable product. A communication.

Dated April 16, 1853.

921. Philip Davis. An improved mode of constructing the breasting to the revolving drums or beaters of threshing-machines.

922. Samuel Bayliss. Improvements in consuming or preventing smoke and heating liquids.

924. Jean Marie Souchon. Improvements in the manufacture and purification of gas for illumination and certain products therefrom, and in apparatus for that purpose.

925. Joseph Cooke and William Cooke. New or improved machinery for cutting or shaping corks and bungs.

926. George Albemarle Cator. Improvements in machinery for preparing flax, hemp, and other vegetable fibrous substances for scutching, or other manufacturing processes.

927. Isaac Simpson. Improvements in machinery for covering wire, silk, cotton, linen, wool, or any other flexible material, with wire, plate, silk, cotton, linen, wool, or any other flexible material.

928. Henry Wilks. Improvements in cocks.

Dated April 18, 1853.

930. James Begbie. Improvements in the construction of wheeled carriages.

932. Joel Watts. Improvements in the construction of pistons of steam and other engines, applicable also to force pumps and lifting pumps.

936. James Salter Scarlett and William Smallcombe Passmore. The application of a certain mineral to lamps, in lieu of cotton or other wicks.

Dated April 19, 1853.

938. François George Sicardo. A new rotary steam engine.

942. John Chatterton. Improvements in coating tubes.

944. John Fuller. Improvements in galvanic batteries.

946. Thomas Day. A certain improvement in the manufactory of boots and shoes, whereby great ease is secured to the wearer.

948. Edward Vivian. Improvements in thermometers.

Dated April 20, 1853.

950. John Smethurst. An improved plan for packing yarn and other materials.

952. Emile Chappuis Fils. An improved apparatus for the diffusion of light, to be called the "myriastratic reflector."

954. Thomas Cooke Foster. An improved reaping-machine.

956. Richard Archibald Brooman. Improvements in reaping and gathering-machinery. A communication.

Dated April 21, 1853.

958. Anthony Deale. Ocean floats, which are designed to save lives and light treasures from shipwreck.

960. Charles Reeves, junior. An improvement or improvements in swords.

962. Henry Carr. Certain improvements in the construction of railways.

964. Philip Harris. Certain improvements in fire-arms.

966. William H. Johnson. Sewing cloth, leather, and other materials.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," April 29th, 1853.)

891. Harry Winton and Francis Parkes. Improvements in the manufacture of agricultural and horticultural forks and pronged or toothed instruments, and hoes.

923. Charles Hart. A thrashing, straw-shaking, riddling, and winnowing machine combined.

926. Charles Walker. Improvements in the method of purifying water for steam-boilers and other purposes.

940. Noble Seward. Improvements in applying hydro-pneumatic agency for obtaining motive power.

945. Cornelius de Bergue. Improvements in and applicable to looms for weaving. A communication.

1002. James Spotswood Wilson. Improvements in propelling.

(From the "London Gazette," May 3rd, 1853.)

906. Matthew Samuel Kendrick. Improvements in lamps and burners, and in the apparata to be used therewith.

922. Andrew Edmund Brae. An apparatus for stopping and detaining, or releasing and setting free cords, tapes, chains, ropes, or other flexible lines or strings.

934. William Keld Whytehead. Certain improvements in steam engines and steam boilers.

964. Isaac Lewis Pulvermacher. Improvements in pipes and cigar-holders.

998. Donald Beatson and Thomas Hill. Improvements in the means of propelling ships and other floating vessels.

1014. Thomas Masters. Improvements in machinery or apparatus for cleaning knives and other steel articles.

1062. Susan Walker. Improvements in clogs and pattens.

1076. John Healey. The application of glass and enamel to the flyers and other parts of machinery used in the preparing, spinning, doubling, winding, warping, dressing, and weaving of cotton, wool, flax, silk, flax, and other fibrous materials.

1078. James Stevens. Improvements in grinding and polishing lenses.

1131. John Roberts. Improvements in apparatus for preserving animal and vegetable matters, and for cooling wines and other liquids.

1159. Robert Griffiths. Improvements in giving motion to drills.

1202. James Ward and William Burman. Certain improvements in machinery for making bricks and tiles.

71. Henry Constantine Jennings. Improvements in separating the more fluid parts of fatty and oily matters.

175. Donald Beatson. Improvements in the means of propelling ships and other floating vessels.

381. Peter Armand Lecomte de Fontainemoreau. Certain improvements in treating fibrous substances. A communication.

468. Charles Flude. Improvements in the pro-

duction of spirit, and in the stills and apparatus employed therein.

717. Henry Webster and Edward Dawson Stones. Improvements in the construction of gas-stoves.

745. Thomas Hill. Certain improvements in springs, and also in the modes of their application to railway engines and carriages. A communication.

747. Henry Lee Corlett. Improvements in railway wagons.

756. George Shaw. Improvements in the manufacture of knives and forks.

757. Julian Bernard. Certain improvements in boots, shoes, and clogs, and in the machinery or apparatus and materials connected therewith.

793. William Edward Newton. Improvements in engines to be worked by air or gases. A communication.

822. Edward Simons. Improvements in telegraphing or communicating signals.

843. William Fuller. Improvements in ice-pails or apparatus for refrigerating.

857. Herbert Taylor. Improvements in ornamenting surfaces or fabrics applicable to various useful purposes, such as for covers of furniture, imitation tapestry, carpets, or hangings. A communication.

869. Donald Nicoll. Improvements in garments, and in sewing or uniting the seams of the same.

872. Richard Archibald Brooman. Improvements in grinding and pulverizing gums, gum-resins, and other drugs and articles of similar character. A communication.

877. Downes Edwards. Improvements in signal apparatus for railways.

883. John Smith. An improved mode of suspending carriage bodies.

887. George Elliot and William Russell. Improvements in the manufacture of alkali.

891. Douglas Hebson. Improvements in working the air-pumps of steam engines.

896. John Hinks and George Wells. An improvement or improvements in certain kinds of boxes.

897. Thomas Lovell Preston. An improvement or improvements in cutting out and piercing metals.

900. Charles Lowe. Improvements in mills for grinding wheat and other grain.

908. Charles Green and James Newman. Improvements in the manufacture of wheels.

909. Robert Wyburn. Improvements in the construction of easy chairs.

911. William John Thomas Jones. Improvements in steam-engine governors.

912. David Zenner. Improvements in the treatment of ores and other substances containing metals, to obtain products therefrom, and the apparatus used therein.

913. Alexander Crichton. Improvements in the fittings of bilge-pumps and injection cocks of iron steamers and sailing vessels.

917. William Wilkinson. An improvement or improvements in ropes, cords, lines, twines, and mill-bandings.

919. John Lewthwaite. Improvements in rollers or mountings for blinds, maps, and other like articles.

942. John Chatterton. Improvements in coating tubes.

944. John Fuller. Improvements in galvanic batteries.

952. Emile Chappuis Fils. An improved apparatus for the diffusion of light, to be called the "myriastratic reflector."

965. William Robjohn. An improved meter for measuring and indicating the measure of liquids.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATION.

961. Juan Duran. Obtaining and applying motive power. April 21.

999. Archibald Slate. An improved filter for water and other liquids. April 26.

WEEKLY LIST OF PATENTS.

Sealed April 28, 1853.

1852:

552. George Hattersley.

Sealed April 30, 1853.

1852:

577. John Crowther and William Teale.

578. Edmund Adolphus Kirby.

598. Henry Brook Billows.

608. Jerome André Drieu.

609. John Nicholas Marion.

628. Alfred Sidebottom.

754. William Fraser Rae.

814. Robert Heggie.

830. James Armitage and Charles Thaxter.

1106. John Clay.

1113. Charles Pilkington, Thomas Pilkington, and Abraham Pediger.

1853:

48. George Stewart.

436. Pierre Auguste Tourniere.

438. Samuel Rodgers Samuels and Robert Sands.

451. Pierre Frederick Gougy and David Combe.

628. Thomas Hunt.

Sealed May 4, 1853.

1852:

637. William Pope.

639. Joseph Raynaud.

641. Collinson Hall.
651. Hesketh Hughes and William Thomas Denham.
652. James Hadden Young.
709. George Lucas.
725. Julian François Belleville.
744. Gray Denison Edmeston and Thomas Edmeston.
765. Joseph Johnson.
795. Henry Bessemer.
796. Henry Bessemer.
797. Henry Bessemer.
799. Henry Bessemer.
1105. Charles Constant Boutigny.

1853:

29. William Edward Newton.
341. Henry Pooley.
359. Robert Ash.
368. William Potts.
437. Wright Jones.
483. Frederick Goodell.
491. The Hon. James Sinclair, commonly called Lord Berriedale.
525. Robert Waddell.
555. John Gedge.
562. Richard Barter.
592. James Kimberley.
593. James Hogg, junior.
597. Joseph Shuttleworth.
601. George Collier.
605. George Collier and Samuel Thornton.
607. James Warmsley.
611. George Collier.
619. Moses Poole.
627. George Michiels.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
April 29	3455	W. W. Woodhill	Birmingham	Door-fastener.
30	3456	J. Smith	Birmingham	Metallic pen.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

April 30	506	C. Osborne	Camberwell	Skein-wheel.*

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NAPIER AND LUND'S PATENT STEERING-APPARATUS.

Fig. 1.

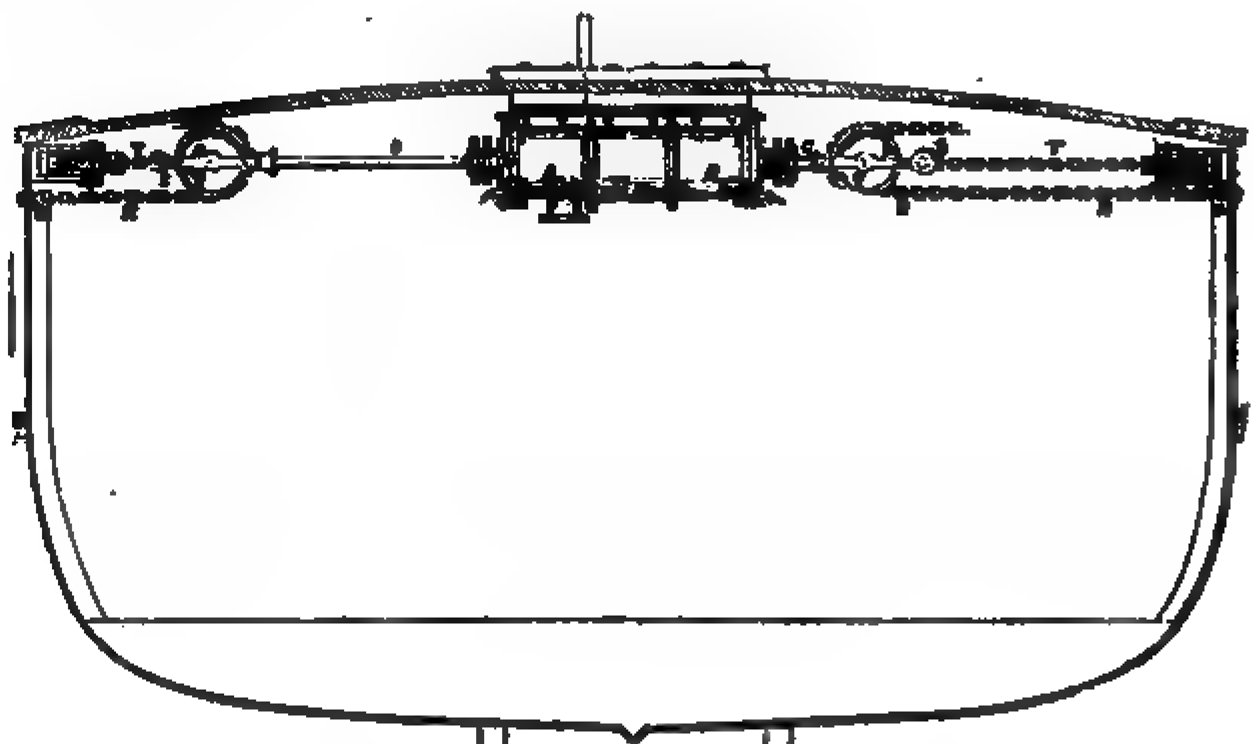


Fig. 2.

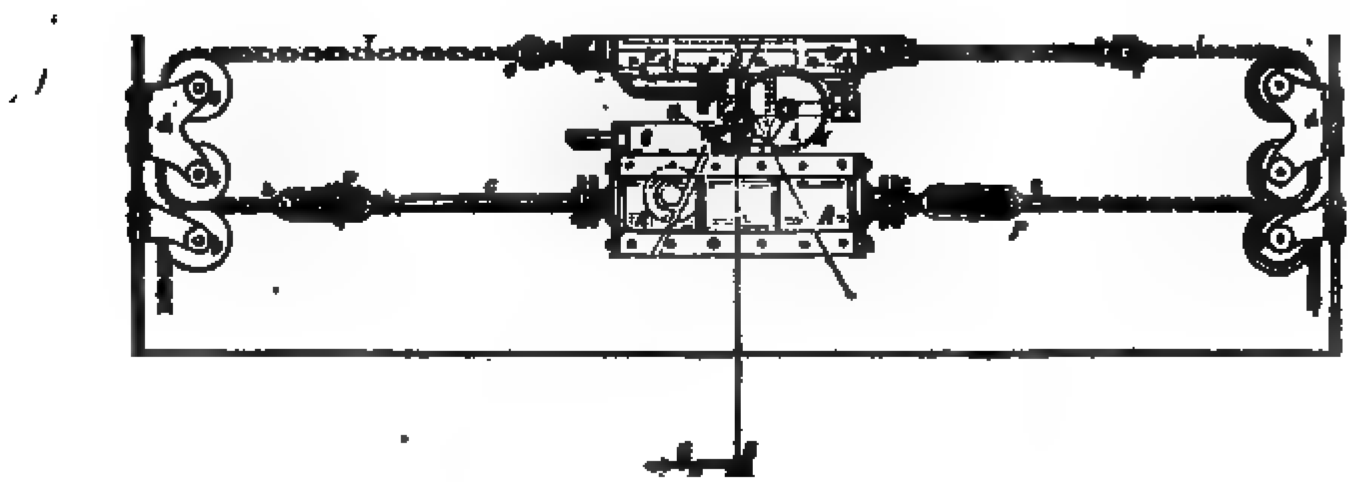


Fig. 3.

NAPIER AND LUND'S PATENT STEERING APPARATUS.

(Patent dated October 4, 1852.)

The arrangement described in this patent is intended to effect the steering of vessels of any magnitude, with the aid of steam and water power; steam being employed as a moving force upon the rudder, and water as a break, so as to render the entire combination susceptible of the nicest adjustment. Two other methods, having the same object in view, are also described in the specification, in which water and steam respectively are employed alone. By a reference to the accompanying figures, the following description of the invention will be readily understood:

Fig. 1 is a side elevation, and fig. 2 a plan of a steam cylinder and water break for acting upon the rudder, and for retaining it in any required position. A A is a steam cylinder, provided with two covers and stuffing-boxes, B B; C C are two piston-rods connected to one common piston. The cylinder is provided with valves and ports for admitting the steam before or behind the piston, as may be necessary. Steam-supply and exhaust-pipes are also connected to the cylinder, as in an ordinary high-pressure steam engine. D is a water-cylinder, fitted with a piston and piston-rods in the same manner as the steam cylinder before described. A cock, E, is fitted to this cylinder, by which the communication between the two ends of the cylinder is opened or closed. This cock is moved by means of the lever or handle, F, seen in elevation in the detached view, fig. 3, and in dotted lines in fig. 2. G is a valve-casing, enclosing the slide-valve of the steam cylinder A; H is the valve-spindle, and I a link by which it is connected with the lever, J, seen in dotted lines. On the shaft of the lever, J, is keyed the spur-wheel, K, or a segment, which gears into a pinion, L, firmly fixed on the tube, M, through the centre of which tube passes the shaft, N, on which the handle or lever, F, is keyed. O is another handle or lever, which is keyed on the tube, M, on which the pinion, L, is fixed, below the handle, F. The ends of the piston-rods, C C, are furnished with frames, P P, which support the pullies, Q Q, and over these pullies pass the chains, R R, one end of each of which is attached to the ship's side by the shackle-bolts, *a a*. Their other ends, R R, pass over pullies, *b b*, and thence along the ship's sides, and round other pullies, not seen in the engravings, to the tiller of the rudder. S S are eyes formed in the frames, P P, to which are fixed the chains, T T, passing round the pullies, *c c c c*, which run in brackets, *d d d d*, attached to the sides of the ship, or otherwise conveniently situated. The ends of the chains, T T, after passing round the pullies, *c c c c*, are connected to the ends of the piston-rods of the water-cylinder by means of the links, *e e*.

The operation of the apparatus is as follows:—To work the rudder in either direction, the handle, O, is turned, which, by means of the pinion, L, and wheel, K, gives motion to the lever, J, on the same axis as the wheel, K, which, through the intervention of the link, I, and the valve-spindle, H, causes the steam to be admitted to the cylinder, A, through the valve in the casing, G. The piston in that cylinder is thereby forced to traverse it, drawing with it the chain, R, attached to the tiller. In order to allow the movement just mentioned to be performed, the handle, F, must be turned, and by this means the cock, E, will be opened, and the water before the piston in the water-cylinder, D, which would otherwise have obstructed its movement, allowed to flow out, until the rudder has arrived at the desired position. This being accomplished, the rudder may be retained in that position by closing the cock, E. When the rudder is required to be again shifted, the motion of the handles, O and F, must be reversed, and the steam admitted on the opposite side of the piston, so as to give motion to it in the contrary direction.

In some cases, instead of a steam cylinder, as in the arrangement before described for giving motion to the rudder, the patentees propose to employ a water-cylinder, and to force the water into it by means of a pump, so as to cause the piston to be moved, and so give motion to the rudder by a similar arrangement of chains, &c., to that before described; the water on the opposite side of the piston being allowed to escape from the cylinder at any required velocity, so as to act more or less as a break or check. They also use a water-cylinder in combination with a rudder arranged according to the ordinary plan, and employ it, either as a break, or to fix and retain the rudder in any desired position.

THE TRADES OF BIRMINGHAM.

The export returns to the 5th of April last have just appeared, and show a most satisfactory state of trade, as far as Birmingham and the neighbourhood are concerned.

Upon nearly every article of manufacture there has been an extraordinary increase, and there is every reason to believe the make during the ensuing quarter will surpass that of any preceding. The report of hardwares has attained a higher figure than has ever before been reached, the increase being 72,000*l*., a considerable portion of which is due to the demand for Australia. The increase in the exports of iron is almost beyond credence, the excess being more than the entire value was at a very recent period. The article of brass is also recovering something like a sound position; and tin plates still promise to become an important branch of our industry. The following is the declared value of exportation of goods manufactured in this locality:—Iron, 838,606*l*., being an increase over the corresponding month of last year of 838,109*l*. Steel, 838,606*l*., being an increase of 11,290*l*. Upon copper there has been an increase of 4,803*l*., brass 2,462*l*., lead 2,539*l*., tin plates 64,823*l*., glass 7,669*l*., hardware and cutlery 72,712*l*., machinery 26,619*l*.

The tool business is very busy, and, as was the fact six months ago, there is a large order in town for handcuffs for Australia and California. But the largest demand made upon Birmingham manufacturers which we have heard of during the present week, is one for iron houses, cavalry barracks, and a church, for Australia. According to our information, several hundreds of these dwellings are in course of construction in the neighbourhood of Smethwick. A house of the description now making, on its arrival in Australia, will be worth about 70*l*. We have not heard the value of the church or the barracks estimated.

During the last few days a consignment took place, through a highly respectable American house, of a considerable quantity of machinery, intended as an experiment in the manufacture of an important article of which Birmingham has hitherto had the almost exclusive make. It is no other than the steel pen. It appears that up to the present time we have supplied America with this article of immense consumption, there not being any manufactory of them in the United States. A few months ago, however, some parties skilled in the manufacture of steel pens, left here to settle in America, and succeeded in establishing a firm for the purpose of introducing the steel-pen trade. Orders were sent over to Birmingham for presses and the necessary machinery to enable them to commence operations, and these articles were shipped off a few days ago, with a number of the best hands that could be procured. The men have been engaged on permanent terms and excellent wages, and the persons who have embarked their capital are said to have done so on the promise of large support from many extensive American merchants desirous of cultivating this trade in their own country. They will, however, require time, and no small outlay, before they can attain that perfection in manufacture at which Gillott and others have arrived in Birmingham. For cutting and finishing, we are in possession of skill and machinery unequalled in the world. It is, however, an experiment on the part of our friends and customers which will require increased activity and vigilance in Birmingham.

The competition which for some time past has prevailed in the cut nail business has rendered it almost profitless at home, but a great and lucrative trade has been carried on with other countries. Our merchants, however, complain that unfair means have been adopted in some parts of South America to exclude this article of Birmingham make from that hitherto very excellent market. The authorities have recently laid on a duty of 2s. per 100 lb. upon British manufactured nails; and this, it is contended, is done to favour certain Madrid makers who have an establishment in South America. This, when the reduction of the duties on South American sugars by this country is taken into consideration, is considered to be a gross act of injustice.

THE IRON TRADE.

Birmingham.—The check given to speculators in iron ten days ago has rendered the Staffordshire market somewhat flatter; for, although it is understood that the defaulter to whom allusion is more particularly made has abundance of property, when realized, to meet all his engagements, there are persons in this neighbourhood who, in the meantime, must be subjected to considerable inconvenience. There are heavy amounts distributed among the ironmasters of this neighbourhood; but it is believed that matters will be ultimately satisfactorily settled. A meeting of Mr. Attwood's friends, to effect arrangements, it was said, was to be held in London on Friday last, and confident hopes were entertained that it would pass off pleasantly. The fact is, that a great deal of the iron purchased on speculation has not yet been delivered. Contracts were entered into, acceptances given, and the times of delivery fixed, but, as we are informed, no small amount of iron for which bills have, or are about to, become due, is yet at the ironworks. But, notwithstanding recent untoward circum-

stances, the general iron trade is active, although prices have, if anything, a tendency towards a slight decline. In all its legitimate branches it continues to present a favourable aspect. Bars during the last week have been offered by a first-rate house at 9*l.*, with the usual credit—a price somewhat easier than that which ruled a fortnight ago. The pig-market is quiet, but it is hoped will not remain in its present condition for any length of time. The late speculations have done great injury to this branch of the iron trade. The quoted price of hot-blast pigs from mine is 4*l.* 15*s.*; inferior qualities are being sold for less, but, when we take into consideration the high price of material, the above quotation cannot recede much. It is said that about 15,000 tons of pigs and finished iron, purchased by one of the late speculators, will soon be thrown into the market for what it will fetch; and this commonly-reported circumstance renders buyers at present very scarce.

Glasgow Pig-Iron Market.—Glasgow, May 7.—Our market for pig-iron has been quiet during this week, and prices have given way about 1*s.* per ton from the quotations of this day se'nnight. We close to-day with iron offering at 50*s.* 9*d.* cash; buyers to a limited extent at 50*s.* 6*d.*—the demand chiefly for shipment and local consumption. No. 1 g. m. b. is quoted 51*s.*; Glengarnock, 52*s.* 6*d.*; Gartsherrie, 55*s.*, cash, against bill of lading.

America.—The advices brought to Liverpool on Monday, by the *America*, were from New York to the 26th, and from Boston to the 27th ult. The iron-market was in the same state as the last accounts represented. The *Arctic* arrived at Liverpool on Wednesday, with advices from New York to the 30th ult. By these we learn that the market was inactive. Scotch pig was held at 35 d. 50 c. from the wharf, and to arrive, 33 d. to 34 d. 50 c. on time. Bar-iron inactive.

ON THE APPLICATION OF THE WAXED-PAPER PROCESS IN HOT CLIMATES.

The following paper, by Dr. Percy, on the waxed-paper photographic process, as applicable to hot climates, was read before the Photographic Society.

One of the most important results to be expected from the formation of the Photographic Society, is, it appears to me, the communication and comparison of the observations and experiments, with each other, of various photographers. Photography is pre-eminently a practical art, requiring the utmost dexterity and care in manipulation. Success eventually depends upon attention to the minutest points, which, to any but a photographer, might be regarded as trivial and unimportant. The object of this society is twofold:—1. The promotion of the art of photography; and, 2. The scientific investigation of photographic phenomena by the aid of optical and chemical science. There is no field in science which promises, at the present time, a richer harvest to those who possess the scientific acquirements which qualify them for its cultivation. I have this evening to submit to the notice of the Society a few practical observations on the waxed-paper process; and I do so entirely in the hope of exciting a discussion on the subject, and not as presenting any studied disquisition on this branch of the art. The point to which I wish especially this evening to direct attention is the special application of the waxed-paper process in hot weather.

Last summer, it will be remembered, the temperature was unusually high, particularly in the early part of July, the thermometer frequently indicating 90° Fahr. in the shade. We shall all long remember the tropical character of that sultry season,—the sun shining without a cloud for days in succession. I heard numerous complaints from photographers, to the effect that they had great difficulty in obtaining pictures, whether on collodionised plates, or on paper; and I met with numerous failures myself with the paper process. There can be no doubt, I think, that these failures were entirely occasioned by the high temperature of the season. I had before been constantly accustomed to work successfully with the ordinary paper process in the taking of landscape views; the iodized paper having been excited on the morning of a calotype excursion, the image was developed in the evening on returning home, after wandering over hill and dale many a mile.

In cold weather, I have taken a tolerably good picture some days after the excitement of the paper; but in the season mentioned, I was unable to succeed in producing pictures at all satisfactory, unless the process of development took place immediately, or very shortly after the slide was withdrawn from the camera. The image, if developed at a later period, was most unsatisfactory, the defect being especially conspicuous on viewing the negative by transmitted light. It was porous, and particularly so on the darker parts.

The process which I employ is as follows:—1. The paper is iodised by the

single wash: 20 grains of nitrate of silver require for complete solution, in 1 fluid ounce of water, about 230 grains of iodide of potassium. 2. Exciting liquid. 50 grains of nitrate of silver to 1 fluid ounce of water: 1 or 2 drops to 1 dram of water, and 1 or 2 of aqueous solution of gallic acid. 3. Developed by aceto-nitrate and gallic acid diluted with once or twice the volume of water.

With the waxed paper, on the contrary, I met with excellent results during the hottest part of that sultry season, having obtained a good picture after subjecting it to the following severe test. I excited the paper in the morning, about ten o'clock, and immediately afterwards exposed it in the camera. I withdrew the slide containing the paper, covered it with a black velvet bag, and left it during many hours of the day freely exposed to the brightest sunshine. I developed the image at ten in the evening, and with perfect success. The experiment was made on one of the hottest days in the early part of July. I have made several experiments on this subject, and with the same result. Hence it would seem that one special advantage in the use of the waxed paper is, that it will keep well in hot weather. It may, therefore, be confidently recommended to travellers in hot climates. For travellers, there is no photographic process which, in respect to convenience, can be compared to the paper process; and unless the paper will keep a reasonable time when excited, the application of this process for landscapes is necessarily very limited. The traveller should be able to excite the paper over night, and walk from place to place with his camera,—take any view which he may desire, and return home in the evening to develope them. Unless he can do this, he must have his portable tent, and carry about with him all the necessary apparatus for manipulation. In certain cases, as in rambles in the east, it may be desirable, from other considerations, to have such a tent, in which calotype manipulations may be also practised; and in such cases, the objection to the processes, in which the excited surfaces will not keep, does not so strongly apply. But even then it is far better, when practicable, that instead of returning from time to time to his tent for the purpose of developing, he should be enabled to take his views at once, and conduct all the developments together. A process, then, is required for travellers, especially in hot climates, in which the greatest portability of apparatus may be obtained; and in which the material upon which the image is to be received will keep for a sufficient time after excitement and exposure in the camera, and which is not likely to be injured or broken to pieces like glass. Now the paper-process is exactly adapted to meet these conditions; and with respect to landscapes, our efforts towards improvement should be specially directed to that process.

As the waxed-paper will keep so well after excitement and exposure in the hottest weather, it might be anticipated that, *cæteris paribus*, it would keep proportionately longer than ordinary paper under ordinary circumstances of temperature in this climate. And the anticipation generally accords, I think, with the experience of photographers. One of the best negatives I ever saw was on waxed paper; it was taken by Vicomte de Vizier, a month after excitement. The scene was part of the Forest of Fontainebleau. I have also myself obtained pretty good results with the use of waxed-paper excited several days previously. In the ordinary paper process, however, I have not succeeded in obtaining an image, worthy of being called a picture, longer than five days after exciting; though some photographers have informed me that they have obtained good pictures a considerably longer period after the exciting process.

It is not my intention, this evening, to enter upon an exact comparison of the relative merits of the waxed and the ordinary paper process. As the waxed-paper process is at present effected, I have no hesitation in expressing my strong predilection in favour of the old paper process for landscapes in this country, under ordinary circumstances of temperature. The long time required in bringing out the image in the waxed-paper process is a serious objection, several pictures requiring many hours' attention in their development. In the waxed-paper process, the sky is generally obtained of a beautiful and intense black, and the limit between it and very distant objects is, generally, well preserved. In negatives obtained by the ordinary paper process, the sky may also be occasionally obtained very black; but in my experience, this blackness of the sky in the latter process is not nearly so uniformly attained as in the waxed-paper process. Much might be said on the special conditions of weather which appear to be most favourable to the obtaining of well-defined distances in calotypes of landscapes, trees, &c.; and on a future occasion, I hope to lay before the Society a communication on this subject.

On the other hand I am not quite satisfied, that in an exact comparison between a good negative on paper, such as Turner's, and a wax-paper negative, the superiority must

not be ascribed to the former. From what I have seen, I should, especially in respect to beautiful gradation of tint, be inclined to say that the old paper process has the advantage. When we reflect that in the ordinary process the image is comparatively superficial; whilst in the waxed-paper process, it penetrates and exists in the very substance of the paper itself; we might expect that in regard to the quality mentioned, the former would excel the latter. In the one case, there is only the irregularity of the surface to deal with; whereas, in the other, there is the irregularity of the entire thickness of the paper itself. I have, as I observed at the commencement, presumed to lay these observations before the Society with the object of exciting a discussion, which, in its effect, I believe, cannot be otherwise than useful to all photographers present. By comparing the experience of one photographer with that of another, we shall assuredly tend to the improvement of an art, the beauty and importance of which are now so widely recognised and appreciated.

Mr. Fenton begged leave to make a remark upon one of the objections urged by Dr. Percy to the use of waxed-paper, viz., the length of time required for the development of the image in the bath of gallic acid. He pleaded guilty to the charge of having occasionally spent a good part of the night in developing the morning's pictures, but stated that this arose rather from the number of negatives taken, and the unwillingness to lose, altogether, a negative, containing some good parts, or representing, however imperfectly, some scene of which it would not be easy to obtain another picture, than from any defect in the process itself. So far as his observation went, the proper time for the development of a picture was from half an hour to an hour, or, at most, an hour and a half. Pictures developed more rapidly were wanting in half-tones; those which required a longer period were generally feeble in the dark, and dirty in the parts which should have remained transparent, and were, in fact, such pictures, as in the ordinary process could not have been brought to anything like a tolerable result. As Dr. Percy had given some account of the mode in which the waxed paper was acted on by extreme heat, it would be of interest to the Society to examine some photographs (which were handed round for examination) produced in the month of October last at Kieff (Russia), in an afternoon when the thermometer was standing considerably below the freezing point.

Doubtless the length of time required for the production of a good negative by the waxed-paper process was longer than by the ordinary double iodide method: there had not been wanting, however, indications in his experience of the possibility of rendering it much more rapid. The paper upon which the greater part of Mr. Fenton's negatives were taken was iodized by the following preparation:

Rice water . . .	1000	grammes.
Iodide of potassium .	50	,,
Bromide of potassium	8	,,
Cyanide of potassium	2	,,
Fluoride of potassium	1½	,,

For paper intended to be used the same day that it was excited, 2 grammes of common salt were added to the iodizing solution. This addition increased the rapidity of the formation of the picture, but much lessened the time during which the paper could be kept in a sensitive state uninjured. The solution for exciting the paper was the usual one of 30 grammes of nitrate of silver and half a drachm of acetic acid to the ounce of water.

CALORIFIC EFFECTS DEVELOPED IN THE VOLTAIC CURRENT. BY M. FAVRE.

(Translated for the *Chemist* from the *Comptes Rendus*.)

Many physicists have occupied themselves with the question relative to the heat disengaged during the passage of a voltaic circuit; I may mention in particular MM. de la Rive, Peltier, Joule, and Edmond Becquerel. The amount of heat disengaged in the circuit during the passage of the electricity, depends on the conductibility, and the laws of this disengagement of heat have been studied by M. Edmond Becquerel. But no one, to my knowledge, has hitherto succeeded in solving the following problem: — Is the heat developed by the passage of electricity through the conductors of a pile, an integral part of the heat brought into play by the chemical actions alone, which develop the current?

By proving that these two actions are in reality complementary, and that the heating of the wire is derived from the heat disengaged by the pile, we should arrive at the solution of a problem which includes in its interest the electro-chemical theory of the pile itself. We should likewise find in this study the starting-point of some connections which it would be interesting to establish between the chemical actions and the dynamic effects which may be derived from them. For this purpose I used a mercurial calorimeter, which served M. Sil-

bermann and myself for a series of thermo-chemical researches already known to the Academy. The muffle of this calorimeter, constructed on a larger scale than before, was capable of receiving a small helical pile, and formed of one element of platinum and amalgamated zinc.

I could easily value as caloric the quantity of heat poured into the calorimeter by the pile when in action. In the case of an external circuit, it would be necessary to add the calorific effect due to the resistance of the circuit, to give the total effect. Instead of measuring this last effect separately, to ascertain whether it was complementary to the first or not, I thought it would be sufficient to close the voltaic circuit even in the interior of the calorimetrical muffle, by causing a variation in the conductibility by the interposition of platinum wires of various diameters. By this means, the whole of the heat developed is poured into one single calorimeter, and measured by the indications of the column of mercury. Now, in operating in this manner, and I insist on this point, I have always found the same quantity of heat disengaged for one sum of chemical actions, that is, when one volume of hydrogen was collected. The diameter of the wires had consequently no influence excepting to accelerate or retard the time necessary for the disengagement of the same volume of hydrogen, and to displace from the place of the disengagement a fraction of the heat produced.

In consequence of the experiments of M. Mayer and Mr. Joule, and the considerations suggested by these works to MM. Clausius and Thomson, many physicists seem inclined to introduce, according to the ideas of these learned men, a new element in the discussion of the dynamic effects of heat. We should be led to admit that during the development of dynamic actions produced in the train of calorific phenomena, there is a certain quantity of heat; which is, so to speak, lost as to thermometrical effect so long as the dynamic action is continued; this quantity of heat again becomes perceptible when the movement or the motive work developed is destroyed. I asked myself if the action of the pile applied to develope magnetism in soft iron might not be susceptible of the variations noticed by the sum of heat poured into the calorimeter, in the case where the temporary magnet is used to produce a dynamic action, to bear a certain weight, for instance. Would there be an equality in the quantities of heat developed by one sum of the chemical actions of a pile, according to whether the electro-magnet carried or not the maximum weight for which its magnetic power was prepared?

I have undertaken several experiments for this purpose; but hitherto, by reason, perhaps, of the small dimensions of the muffle of the calorimeter, and the weakness of the pile therein lodged, the differences which have appeared are too trifling to enable me to come to any conclusion. I am now engaged in repeating those experiments on a larger scale, and I shall hasten to lay the results before the Academy, if they appear to me worthy of its attention.

INSTITUTION OF CIVIL ENGINEERS.

Sitting of Tuesday, May 10.

THE Chair was taken by James Meadows Rendel, Esq., the President, and the evening was devoted to the discussion of Mr. Coode's Paper—"A Description of the Chesil Bank, Portland."

After passing deservedly high encomiums upon the Paper, it was remarked, that however acute and scientific the observations might be on this particular locality, it would not be prudent to receive the conclusions as applicable to beaches in general under all circumstances; in fact that it would be safer not to generalize upon this or any other isolated case. As to the position of the large shingle on any shelving shores where the waves could only act upon the beach at or about the time of high water, the larger pebbles were found near the top after the occurrence of storms, because, under such circumstances only, did the waves exert sufficient power to break heavily upon the beach; under light winds, the force of the waves was expended in the shoal-water before reaching the beach.

Instances were given of the motion of shingle, as affecting the entrances of harbours, which was the main practical point to be considered by the civil engineers. At Lowestoft, just as much sand was washed up as supplied that which was required for ballasting the vessels frequenting the port; at Sunderland, the cross action of the waves, influenced by the ledge of rocks outside the new harbour, caused a deposit of shingle on the opposite sides of the groins.

The work of Lamblardie on the motion of shingle—"*Mémoire sur les Côtes de la Haute Normandie*"—was referred to as corroborating the views of the author of the paper on the motion of "beach" by the wind-waves, and giving valuable facts bearing on the subject.

Viewing the relative position of the geological strata of the coast to the westward of Portland, it was considered probable that the extent of chalk exposed to the action of the waves had at a former period been much

greater than at present; that the disintegration of the underlying green sand had expedited the fall of the chalk and flints, and thus supplied the material for forming the bank. The travel of pebbles was gradual and distinctly up and down the beach, having an onward tendency in the upward motion, and yielding to the force of the then existing wind-wave. At an angle of about 45°, the greatest amount of travel or onward movement was observed; but the size of the shingle, more especially, was determined by the amount of undulation.

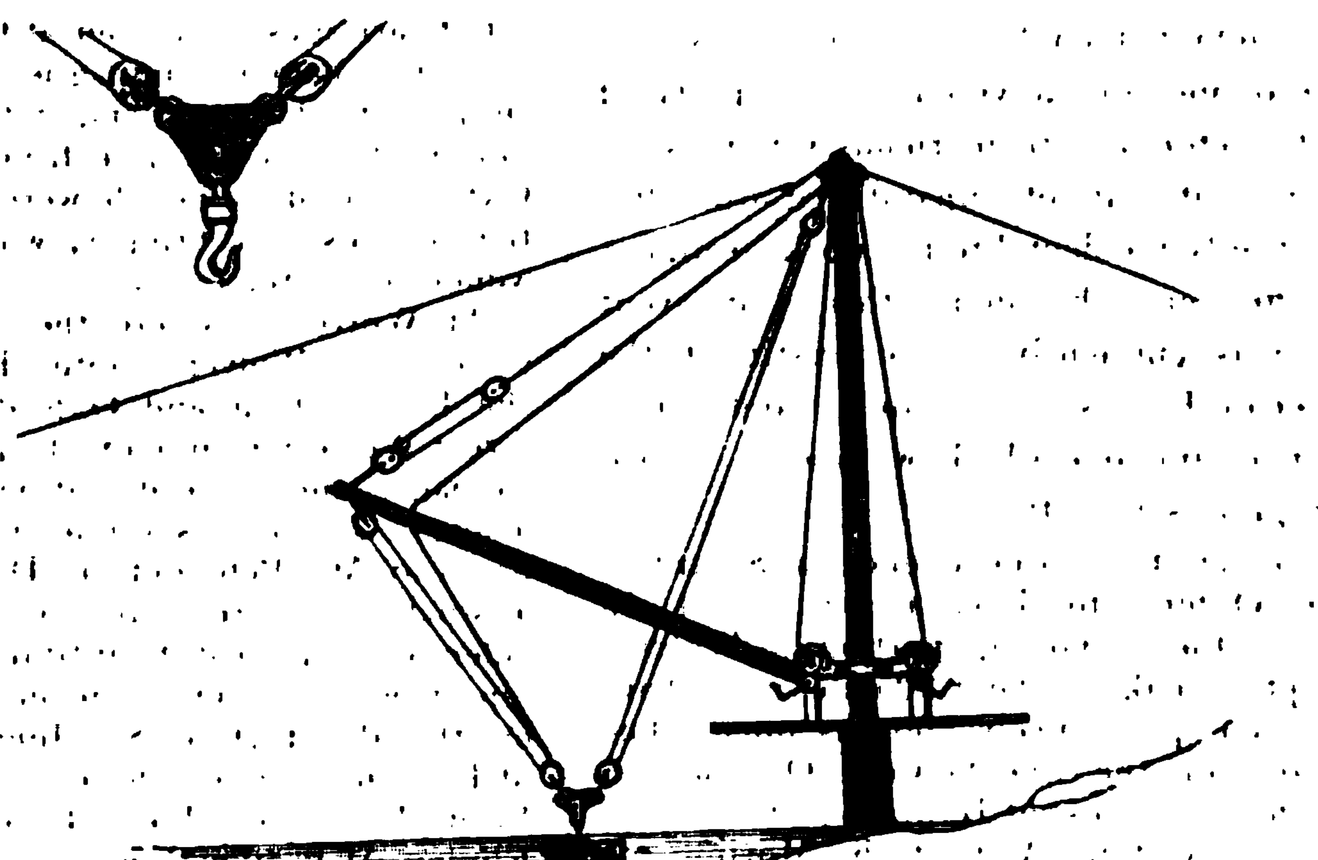
So much interest had been excited by this paper, and by the valuable facts laid before the meeting, and it was evidently within the power of so many engineers to transmit the results of their observations on the shores adjoining the works under their charge, that an appeal was made from the chair, for their attention to so evident a mode of benefiting the Institution, while the best interests of science would be advanced.

The following papers were announced to be read at the meeting of May 17th;—"On Stirling's Air-Engine," by Mr. J. Leslie, M. Inst. C.E.; "On the Caloric Engine," by Mr. C. Manby, M. Inst. C.E.; and "On the Conversion of Heat into Mechanical Effect," by Mr. C. W. Siemens.

THE AMERICAN DERRICK.

The following simple and effective mechanical combination, used for some years past in the United States of America, is described in a letter from Lieutenant M. C. Meigs, of the United States' Engineers, to the Editor of the *Civil Engineer and Architect's Journal*.

After observing that he has never met with a published description of the machine, he goes on to say it is so cheap and simple in construction, and so exact and convenient in its use, depositing the largest mass within its power at any spot within a circle equal in radius to the boom, that he thinks it only necessary that it should be known to be more generally adopted. The general arrangement of the derrick is shown in the accompanying figure.



The mast is supported in a vertical position by four guys, attached to a ring on a cast-iron cap on its head. Below this ring, and revolving freely upon the cap, is a wrought-iron frame containing two sheaves of cast-iron. The lower part of the mast is rounded above a shoulder. A revolving frame of wood, embracing the mast and carrying two rope-barrels with gearing and winches, rests upon the shoulder. The boom is stepped into the upper part of this frame, and a light platform for the winchmen is secured to the lower part, so that boom and platform and winches all revolve together round the mast. Booms, 50 feet in length, are commonly used, and the outer end is supported by a topping-lift secured to the revolving iron frame on the cap at the head of the mast. Two tackles are used, one suspended at the outer end of the boom, the other to the frame at the mast-head. Both falls lead over the sheaves at the mast-head, and thence to the winch-barrels. The lower blocks of the tackles are attached to two corners of a triangular plate, the third carrying a hook, as seen in the sketch. It will be evident, from this description, that by hauling or slacking

upon the falls alternately, the stone suspended from both can be placed directly at the foot of the mast or under any point of the boom; and as the latter revolves as a radius vector, any point within a circle of 100 feet in diameter can be reached.

In practice it is convenient to raise the foot of the mast upon a blocking of timber, some slight braces sufficing to prevent the step from sliding. Three 50-feet booms placed so that their circles intersect, will place every stone in a large building, or a sea-wall 300 feet long. A word, or a sign to the winch-men serves to direct them, and the stone moves to its place with the utmost precision, and as gently and quietly as a feather.

OPENING OF THE OXFORD, WORCESTER, AND WOLVERHAMPTON RAILWAY.

The successful completion of the long and laborious engineering operations encountered in the construction of the Oxford, Worcester, and Wolverhampton railway, was celebrated on Saturday by an experimental opening, at which a large party of the Directors and their friends were present. After eight years of unparalleled difficulty,—not only incidental to the work itself, but of a financial character,—this is an event which is eminently characteristic of the power of English skill, capital, and perseverance, and one which we should regard with great satisfaction.

The length of line opened on Saturday, from Oxford to Evesham, is about 40 miles,—the remaining portion, to Wolverhampton, making about 90 miles in all, having been opened twelve months since. The stations on the line between Oxford and Evesham are those of Hanbury, Charlsbury, Ascot, Shepton, Addlestrob, Morton-in-the Marsh, Bockley, Campden, and Honeywood, the most of which were decorated with flags, evergreens, and flowers, attended by bands of music, and lined with spectators, notwithstanding that it rained heavily throughout the day. The works on the line are not generally heavy, though in the first 15 or 16 miles from Oxford there have been nearly fifty bridges to construct.

The special train conveying the Directors, their friends, and the authorities of the towns along the line from London to Oxford, consisted of 26 first and second-class carriages, and passed over very slowly. The line is only laid down singly, though with the conjoint gauge, broad and narrow, with crossings and side-lines half a mile in length at every station, to enable one train to pass another without difficulty. It appears to be admirably consolidated, and all the works do the utmost credit to the contractors and engineers employed in the construction.

At Evesham the party from Oxford was joined by a large number of gentlemen from Dudley, Worcester, and surrounding districts, who returned with them to Oxford.

The line was to be opened to the public on Monday, but this was rendered impossible from the circumstance of Captain Simmons, the Government inspector, having required the alteration of certain switches at the point of junction with the Great Western line at Wolvercot, and the Great Western Company having refused to agree to any code of signals for working into their station at Oxford without a reference to the Board of Trade. In consequence of this latter circumstance, the carriages of the Oxford Company could on Saturday only be brought down to the point of junction, about three miles from the Oxford station, the Company having to remove from one set of carriages to another at that point.

At Evesham a champagne luncheon was supplied to the travellers, and all along the new portion of the line from Evesham to Oxford crowds of people were assembled at the stations and bridges, who gazed with wonder upon the train.

At Wolvercot, where the Oxford, Worcester, and Wolverhampton Railway joins the Birmingham and Oxford line of the Great Western Company, the party changed carriages, and proceeded at once to Oxford. There a sumptuous dinner had been prepared by Mr. Peto and the Directors at the Town-hall, where four ranges of tables, laden with a most bountiful and delicate repast, were spread. The chair was taken by the Right Hon. Sir John Pakington, M.P.; and among those present were—Lord Lyttelton, Earl Talbot, Viscount Elmley, M.P., the Hon. Captain Rushout, M.P., Mr. Langston, M.P., Mr. Oliveira, M.P., Mr. Peto, M.P., Dr. Jeune, the Master of Pembroke, and numerous other dignitaries of the Oxford University, and Mr. Rosse. Mr. Harker officiated as toastmaster.

A number of loyal and appropriate toasts having been drunk and responded to, the guests retired from the hall shortly before 8 o'clock. Those from Dudley and the North returned by special train from Oxford about a quarter-past 8; and those from London by special train about 9 o'clock.

EXPLOSIONS IN MINES AND COLLIERIES.

The following observations on the causes of explosions in mines and collieries, and the means of preventing them, are taken from a Paper by Mr. Robert Blackwood, of Kilmarnock, which was read at the Society of Arts.

For the safe and efficient working of any mine, a proper system of ventilation is necessary for the free respiration of the workmen, and also for the purpose of carrying off the noxious and dangerous gases that exude from the coal as the work proceeds. The development of carburetted hydrogen gas, or fire-damp, the dread of the miner, and the cause of such fearful loss of life, is inseparable from mining operations, being produced from the decomposition of the vegetable matter of which the coal is composed, and lies dormant and pent up in the numerous cavities and fissures of the coal seam. In deep mines, and those in which the coal is of a rich quality, this gas is given off in great abundance from the numerous cavities or pores in the strata being intersected and laid open by the operations of the miners, and is constantly being drained off as fresh faces of coal are exposed. This gas sometimes exists in the seams under very considerable pressure, and rushes out into the workings with great force. When mixed with a certain proportion of common air, this gas becomes highly inflammable when brought in contact with flame, giving rise to fearful explosions, and consequent loss of life, when a miner carelessly, or through ignorance perhaps, exposes his naked lamp or candle to this treacherous atmosphere. Hence the necessity for a vigorous ventilation, and an ample supply of fresh air at all times to the workings, to dilute the atmosphere of the mine below the firing point, and thereby render it harmless and safe for the operations of the miners.

Except where the ventilation is natural (a system that cannot be sufficiently deprecated), the means almost universally adopted for clearing and keeping the mine free of this explosive atmosphere, is ventilation by rarefaction. In a mine where only one shaft is sunk to the coal, a partition, or brattice, generally of wood, is put in, dividing the shaft into two sections from top to bottom, the one termed the upcast, the other the downcast shaft. At the bottom of the upcast shaft a powerful furnace or cube is kept burning, which has the effect of rarefying the air, and producing an ascending current in the upcast shaft; the cold, pure air going down the downcast, to fill up the partial vacuum caused by the rarefaction, communicates motion to the air throughout the mine, and thereby causes a current of fresh air to circulate and sweep along the face of the coal in process of being wrought, diluting and carrying off the carburetted hydrogen as it is produced through the furnace to the upcast shaft, and thence to the external atmosphere.

It will be at once apparent that a copious air current, and the keeping of it in its proper course, is of the first importance, as upon it depend the ventilation of the mine and lives of the men employed; as in almost every instance where accidents from explosions of fire-damp occur, the cause may be almost invariably attributed to an insufficiency of air, either from a defective furnace, contracted air-courses, or the current being allowed to leak or waste, or otherwise improperly applied. In the process of excavating the coal, the current is kept up to air the face of the workings, by stoppings of brick and mortar being put in, from time to time, betwixt each row of pillars as the work proceeds; so that what was formerly a room or bord now becomes a passage for the intake of fresh air as each pillar is formed, thus making a continuous air-course from the botton of the downcast shaft, round the face of the workings, and back again through the furnace to the upcast shaft.

Explosions of fire-damp frequently arise from want of attention to the doors in the drawing-roads and air-courses, which, except when a miner is passing with his load, should always remain closed. These doors are in some collieries kept by boys called trappers, and in others they are self-acting swing-doors. Colliery managers are divided in opinion, on which of these two systems most dependence can be placed. In either case, this department of the underground management requires the most vigilant oversight; neglect of this is ruinous to the entire ventilation. It matters not how superior and complete the other arrangements of the mine are, the most powerful furnace will be found inadequate for the ventilation of the workings in advance of any door left open, as the current will entirely abandon the face of the workings, and rush straight to the furnace by the shortest and most direct course it can find. The ventilating current is then diverted out of its course, fresh air is no longer carried forward to the workings in advance to this point, the atmosphere of the mine gets vitiated, and gradually becomes fiery and inflammable from the accumulation of fire-damp in the working faces, and the miners meanwhile, being unaware of any negligence, and

trusting to the usual supposed safety of the mine, are insensibly surrounded by an inflammable atmosphere, and an explosion is inevitable. Double doors, whether self-acting or kept by trappers, should invariably be fitted in the air-course and main drawing-roads, especially where there is frequent passing. These doors are never both open at the same time, but are arranged so as to open and close alternately, the one shutting before the other opens, and thus acting as a guard upon each other. In well-conducted mines, especially in those of a fiery nature, where working with naked lights is considered precarious, the air-course and drawing-roads are guarded with a set of three doors, thus rendering accidents from leakage or waste of fresh air at this point almost impossible; were this the prevailing custom, loss of life from explosions of fire-damp would be of much rarer occurrence.

Explosions of fire-damp frequently occur from another cause, even with an abundant supply of pure air, and a powerful ventilating current in the air-course. This is the case when a heading or drift has been driven so far in advance of the air-course that the end or face of it is out of the reach of the current. In coal-seams, where fire-damp is given off in great abundance, it is found necessary in excavating a heading or drift, to carry up a little fresh air to ventilate it, whenever the end or face of it is considered beyond reach of the current. This is done by fitting in a brattice of loose boards in the heading, the boards being laid on edge from the pavement to the roof, dividing the heading into two sections, a scale of air being taken up the one side of the brattice to air the face, and then returned down the other side into the air-course as before. Special attention should be paid to this where the strata are much inclined to the horizon, as carburetted hydrogen being specifically lighter than common air, naturally floats uppermost, and gradually rising to the highest point, ultimately accumulates in the end of the heading; and unless air be taken up to dilute it, has no tendency of itself to come down to the air-course to be carried off. Explosions of a trifling nature, attended with little loss of life, occur very frequently in these headings, and extend no farther than the air-course, being there met and extinguished with fresh air; but should the air-current, after travelling along a series of working faces, be so far vitiated as of itself to be also inflammable, an explosion, even of a comparatively trivial kind, is attended with the most disastrous results, as the fire in such a case is taken up by the current, and communicated to the atmosphere of the whole mine.

Loss of life from explosions of fire-damp may be divided into two classes:—First, death caused directly by scorching, and the violence of the explosion; and secondly, death by suffocation from choke-damp. The result of some of these explosions is most disastrous; when ignited at any point, the flame spreads itself throughout the workings in the neighbourhood, and that portion of the mine becomes a mass of living fire. So intense is the heat produced, that the timber is generally all destroyed, and sometimes the pillars of coal are found to be charred to the depth of several inches. The dross, rubbish, and small particles of coal produced from the workings, become ignited, and the enormous expansion of the air from such a temperature drives everything before it: doors, brattices, props, loose masses of coal, together with any unfortunate miners that may be within its influence, are carried out with irresistible force through the air-course or drawing-roads, towards the shaft—the only outlet where the explosion can expend itself. The carbonic-acid gas, or choke-damp, which is produced in great volume from the previous combustion, is drawn back again into the mine, to fill up the vacuum caused by the expansion, and envelopes the miners, so that those who escape the violence of a scorching fire perish from suffocation; as in almost every case when only one shaft is sunk, the brattice is destroyed, and any attempt to restore the ventilation in time to save the men is hopeless. This is, perhaps, one of the strongest arguments in favour of double shafts, now so common in the north of England. The wooden brattice in a single shaft being constantly getting out of order, from moisture and its proximity to the furnace, never, even when in the best condition, perfectly isolates the one shaft from the other; neither can it ever be so air-tight as when two distinct shafts are used, where the mass of earth betwixt them becomes a natural brattice, and also, when an explosion does occur, is of sufficient strength to withstand the shock, so that the ventilation can be restored in a comparatively short time, and the means of raising the miners to the surface still remain available.

From what has been advanced, it will be plain that, under the present system of ventilation by rarefaction, the safety of a mine depends on a powerful furnace, a capacious air-course, the headings well bratticed, and an ample ventilating current.

It is to be regretted that, at the present day, when loss of life from explosions of fire-damp is so very frequent, so much dependence should still be placed on natural ventilation. This system is at once feeble, variable, and uncertain in its action. Instead of being urged on by a vigorous fur-

nace, the ventilating current is caused by, and merely dependent on, the excess of temperature that may chance to be in the one shaft above that in the other, so that the current throughout the mine cannot be otherwise than weak, sluggish, and totally insufficient for the purpose intended. The natural ventilating current in a mine unassisted by a furnace is so feeble as to be most materially affected by any such change of temperature, causing the air in the mine, that should otherwise be circulating briskly, to be stagnant and utterly dead. So imperfect is the ventilation in such cases that upon any sudden change of wind or temperature, the current is sometimes completely reversed, so that what was formerly the upcast shaft becomes the downcast, and the return or vitiated air is drawn back again into the workings as intake or fresh air. This being a circumstance over which no one has control, the ventilation of the mine is for the time destroyed, and any trifling current that may be generated is wholly dependent on the air in any of the shafts assuming a higher temperature than that in the other. Under a system of ventilation so very imperfect, it is not to be wondered at that accidents from explosions, and those of the most appalling kind, should occur. Until this system is entirely abolished, loss of life must continue, and the proprietors and managers of such collieries be, in a great measure, culpable.

A very decided improvement in the system of ventilation is now being pretty generally adopted in the northern districts of England. This consists in working the mine in isolated districts, and splitting the intake air into several distinct columns at the bottom of the downcast shaft, and appropriating one separate column to each district. By this means the faces are aired more perfectly, each current has a much shorter course to travel, the tendency to leakage is less, and the return air is not so much charged with fire-damp,—admitting of a freer use of naked lights than when the air is brought round the faces in one undivided column, and also, when an explosion does occur, it is generally confined to the district in which the gas has been ignited.

It is to be feared that, even under the most approved system of ventilation at present adopted, accidents from explosions of fire-damp in mines and collieries can never be entirely averted. The method of splitting the air and working in districts, however, is certainly a great step in advance, and is at present the most perfect system of ventilation known. If carried out judiciously, and with a rigorous discipline, ordinary caution on the part of the miners will be a sufficient safeguard against explosions, and will, if it do not wholly avert, at least greatly tend to lessen, the number of such direful calamities.

The Cyclopædia of Useful Arts. Edited by CHARLES TOMLINSON. Part XXXI. George Virtue.

THE thirty-first Part of this excellent work is, in many respects, one of the most interesting, and one of the most valuable of the series. The comprehensive and admirably illustrated article on pottery and porcelain has been brought to a conclusion, after exhibiting minutely the details of the principal branches of fictile manufacture. In the ten sections into which it is divided, the processes incidental to the production of some of the most beautiful art-manufactures are popularly and clearly described, as are also others of a more utilitarian kind. One of the sections is devoted to the manufacture of tobacco-pipes—a homely and unpretending article, yet possessing undoubtedly very much to attract the attention, if not the admiration, of the mechanical. Mr. Tomlinson has been at great pains also to explain fully the preparation and admixture of the materials, and the several operations are illustrated by wood engravings. In another section, the operations of throwing, turning, pressing, and casting, are described and illustrated, according to the most improved processes now in use. The important operation of firing is made the subject of an entire section, in which the porcelain furnaces at Sèvres receive a full description, accompanied with figures. The remainder of the article traces the manufacture through the stages which give to the article its domestic, artistic, and commercial value; viz., the glazing and printing in all their subsidiary details, and the painting. The tenth section, which concludes the article, is an elegant and critical dissertation on design in the ceramic arts, in which the author has succinctly, yet boldly and truthfully sketched out the progress of improvement in this great department of our national industry, contrasted it with that of our foreign rivals, and impinged forcibly on the salient points of our short-comings. This will be read with great interest, and being in a great measure founded upon a consideration of specimens of high British art in the Exhibition of 1851, deserves attention as evidencing its present state of cultivation, and its future prospects. An exceedingly copious and well-arranged

article on printing follows at a short distance that on pottery and porcelain. In the vast expanse of literary and mechanical industry which printing and its kindred occupations now fill, a fine field is afforded to Mr. Tomlinson for the exercise of his powers of successful popular description. To convey to the intelligent mind a substantial idea of the infinitely extended and ingenious appliances by which the current literature of the day is presented to the public in a printed form, is indeed a theme which well-deserves the great exertions he has made to do justice to it. We have read with much pleasure his perspicuous and comprehensive account of that portion of the subject which he has dealt with in the present Part, and feel an equal pleasure in stating our impression that it is by far the most clear and detailed account of the subject, having a popular exposition of it in view, we have anywhere met with. After giving an ample historical sketch of the invention of the art, and of ancient expedients resorted to for making mechanical impressions of various kinds, the article proceeds to describe the art of type-founding, and the subdivision and classification of the characters, which is done with much minuteness of detail. The art of the compositor is next explained, and the practice of correcting proofs; in noticing which, the author presents his reader with a few remarkable examples of literary curiosities depending upon misprints, in which one letter has been substituted for another. We now come to the substantial part of the article —the printing press, which has been most successfully described. After explaining the Stanhope, and other presses, with the help of several figures representing the important parts, the steam-machines which astonish the world daily with the magnitude of their results are made the subject of a detailed explanation, which is worthy the perusal of all such as are not intimately acquainted with the present state of steam printing. The subject of stereotyping, which is only in part treated of, concludes the Part.

Considering the appositeness of the following illustration of the advantages of the much-desired museum of inventions, we are induced to add it to the observations we have made on the merits of this Number. It occurs in a note referring to König's printing machine :—" In the Great Exhibition were several printing presses, in which the types were inked by self-acting rollers. Such presses would indeed require the strength of a horse to work them. We have no doubt that much thought, anxiety, and money were expended in these inventions ; but it was a pity that the inventors had not been aware of König's failure and the cause. A well-appointed museum of mechanical arts, on the plan of the Conservatoire des Arts et Métiers at Paris, with models or specimens of machines, a well-digested index of inventions, and with competent persons to answer inquiries, would form an institution worthy of the British nation, and be of essential service to inventors and the progress of invention."

The Contemplated Museum of Inventions.—The movement in favour of the establishment of a museum of inventions, which has been commenced in many of the chief seats of manufacturing industry in this country, is constantly extending itself, further memorials on the subject having just been addressed to the Government and the Royal Commissioners by Glasgow and Sheffield, signed in both cases by all the leading inhabitants of these towns. The Sheffield memorial was presented to His Royal Highness Prince Albert, the president of the commission, on Thursday last, by the Mayor ; and that from Glasgow on Saturday, by the Lord Provost and a deputation. They express the opinion of the memorialists that such an institution has long been needed, and that it will command the zealous support of all who take an interest in the industrial development of this country. It is understood that the Commissioners of Patents, with whom the Board of Trade has entered into communication on the subject, are fully alive to its importance, and that Professor Woodcroft is, under their directions, making every exertion, and with great success, towards collecting such models of inventions and works having reference to them, as may form a nucleus for the contemplated National Museum and Library of Inventions at Kensington. Temporary accommodation will be provided by the Patent Commissioners and by the Royal Commission until the question of the erection of an appropriate building for the due display of the collection is decided.—*Times.*

A Miniature Ocean Steamer.—Early in the summer of last year a small screw steamer was built of iron by Mr. Laird, of Birkenhead, for the Maule River, South America. The vessel is named the *Fosforo* ; her register is 43 tons, and 40-horse power (engine by Mr. E. Humphries) ; depth of hold 6 feet; length over all 105 feet. She left this port on July the 17th, when she was loaded to a foot and a half of the water's edge. She was rigged as a three-masted schooner, and had no keel. The ship's company consisted of commander, two mates, two engineers,

two firemen, and six men. The *Fosforo* arrived at Valparaiso on the 15th of November, having touched at Madeira, Rio Janeiro, and Montevideo, for the purpose of watering. The total consumption of coals, of various kinds, was 160 tons, equal to 138 tons of Welsh coal. The passage occupied 121 days, 46 of which were under steam and sail, and 28 days under sail alone; having averaged six knots an hour all the way out. The remainder of the time was consumed at the various ports touched at in coaling, and repairing some trifling accidents to the machinery, and at anchor through stress of weather in the Straits of Magellan. The *Fosforo* is the smallest steamer that ever performed so long a voyage.—*Liverpool Chronicle*.

SEMAPHORES ON RAILWAYS.

The following suggestion of a code of semaphoric signals, to prevent railway accidents arising from the collision of trains proceeding in the same direction, has been forwarded to us by Mr. Francis Pinney, of Tyndwfr, Llangollen.

A semaphore, on a small scale, is to be placed at every half mile on each side of the railway, and to be worked by a self-acting arrangement, actuated by every train or carriage passing over the line; each semaphore to be provided for that purpose with the most simple contrivance, upon a train passing, of raising and maintaining the arms in, first, a position of rest for three minutes, and then to drop to the second position for a like time. The first position of the semaphore being observed by an approaching train, would indicate caution, the second, danger, making together six minutes. At the expiration of that period the arms shut again, fall into their original place of rest in the first position, and remain so until the next train or carriage would pass and put them again in motion. By this contrivance the driver and guard of every train would be enabled to judge with tolerable accuracy, by the position of the arms of the semaphore, where the previous train might be expected to be overtaken, and would act accordingly. The first position, or position of rest, may simply be that of allowing the two arms of the semaphore to incline downwards below the horizontal line passing through the top of the standard; and in the second position one arm may become vertical and the other horizontal. It may also be made, by varying the arrangement of the signal, to indicate various information, such as the class of train that had last passed, whether ordinary, express, or luggage; and in case of any accident happening, some one attached to the train would hasten back, and raise by hand the accident signal upon one or two of the semaphores, to be removed only by a responsible person when the line was again clear.

THE TABLE EXPERIMENT.

A French paper gives the following account of the table-turning experiment, on the authority of M. Boyer, a gentleman of well-known scientific attainments:

Yesterday afternoon our friend, M. Edward Boyer, professor of natural philosophy and chemistry, came to our office to satisfy our curiosity respecting the reported phenomenon of the motion of a table under the influence of electricity. A round walnut-tree table served for the experiment. Six gentlemen placed themselves round the table, and formed the electrical chain with their hands placed flat on the edge, and each person in contact with the small finger of the right hand laid on the small finger of the left hand of his neighbour. A few minutes only elapsed, when a slight movement of the table revealed the commencement of the phenomenon. Two or three oscillations succeeded at short intervals. Shortly after, the persons placed in contact felt tinglings in the fingers, and slight nervous contractions and precipitate pulsations in the arterial veins. In about seven minutes the table was in movement. The rotation, at first slow, became so rapid as to occasion giddiness to some of the persons who formed the chain, and they were obliged to remove their hands. The table then stopped. The chain having again been formed, the circular movement became renewed in less than two minutes. The magnetic fluid, disengaged in abundance, manifested a series of extraordinary phenomena. Thus it was enough for M. Boyer to place his hands on the table, in order to give it the most energetic impulsion. A young man of twenty years of age, of very great corpulence, seated himself on the table without arresting the movement. It has been said in other accounts, that the current is invariably established from the south to the north pole. This is an error. When once the chain is broken, it follows opposite directions; it goes from the left to the right, and from the right to the left alternately. The experiment made on a hat was also perfectly conclusive. In less than three minutes it began turning round very rapidly. The same was the case with a wicker basket.

NORTON'S PERCUSSION BLASTING CARTRIDGE.

The *Cork Southern Reporter* gives the following account of a trial of Captain Norton's percussion cartridge for blasting:

"Captain Norton practically demonstrated the powerful action of his blasting cartridge in a field belonging to Mr. O'Brien, just beyond the new gaol, on the root end of large trees, which it was found impossible to blast by the present mode of a fuse and tamping. The *modus operandi* was as follows:—A triangle was made of three tall larch spars placed over the root to be blasted, a hole being bored by an auger an inch and a quarter in diameter into the most 'gnarled and unwedgeable' part of the roots, and about 3 inches deeper than the centre, a plug of iron of the same diameter of the augur, an inch and a half long, was then forced into the bottom of the hole, so as to prove a solid foundation. The cartridge with a percussion cap on each end was then dropped in and rested on the iron foundation. A rammer of iron, of nearly the same diameter as the augur, and about 4 inches longer than the depth of the hole, so as to project about 4 inches, was then inserted, and might, or might not rest on the head of the cartridge. A block of wood about 60 lbs. weight, suspended by a strong cord vertically over the projecting head of the rammer, was then allowed to fall on it, when by the momentum or blow, the explosion took place, and in no one instance out of more than a hundred trials was the rammer blown out, or, as military engineers term it, did 'gunning' occur. In one instance the cartridge was made of tin, so as to be waterproof, and when it was inserted and the rammer placed over it, water was poured in, and the explosion was perfect. This was to demonstrate the practicability of blasting rocks under water, lying in the way of navigation. The charge of powder in these cartridges is about an ounce of Hall's powder. It is probable that the fourth part of the powder used in the present manner of blasting will be found by this method to be sufficient. Professors of the Royal Queen's College, and many of the students were present. Captain Norton's ambition is, the removing of the forests on the banks of the Amazon, Orinoco, and their tributaries, thus destroying the wet-nurse of all malaria; and also the forests of Canada, the United States, New Holland, New Zealand, and thus removing the great obstructions to the cultivation of land in all countries; the rousting out of snakes and nuggets in New Holland and California, and the removing of blocks of ice impeding the navigation of the Arctic Seas.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MAY 12, 1853.

John Charles Wilson, of the Redford Flax Factory, Thornton, near Kirkcaldy, Fife, N. B., civil engineer. *For improvements in the machinery and processes employed in and for the manufacture of flax and other fibrous vegetable substances.* Patent dated October 21, 1852.

Mr. Wilson specifies as his improvements an improved arrangement of scutching-machinery, the distinguishing features of which are that the flax straw instead of being presented to the scutching-blade by hand, is held between rollers, which are actuated by a mangle motion, so as to carry forward the straw to an extent that will admit of the breaking operation being performed at one end of it, and then withdraw it to allow it to be turned and the other end presented to the scutchers. These are mounted on a drum or a revolving shaft, and in their revolution come nearly in contact with a rest or bridge, on which the flax straw is supported during the operation. The straw is fed in to the nip of the holding rollers between endless aprons which are worked in connection with them, and which serve also to return the flax to be changed end for end.

Claim.—The construction or combination of scutching-machinery with an endless travelling sheet or apron working in conjunction with a pair of holding rollers, also with blades, knives, or beaters, on a revolving axis, whereby the flax or other fibrous material, when laid upon the travelling sheet, is carried forward to the bite of the holding-rollers, and gradually moved beyond a rest, where it is scutched by the blades, knives, or beaters.

Edward Henry Jackson, Titchfield-street, Soho, machinist. *For certain improvements in producing artificial light, and also in producing motive power.* Patent dated October 21, 1852.

The *first* and *second* parts of this invention consist of an improved arrangement of self-acting regulator for the electrodes of electric lamps, which is actuated by the battery current; and of a governor for controlling the action of the current to be used in connection therewith. The electrode regulator is composed of two insulated metal tubes, connected together by a spiral spring, and capable of sliding one within

the other. They are placed in connection with the wires from the battery, and when the current is on, are drawn together, compressing the spring, by the expansion of which they are gradually forced apart as the carbon points are consumed, and one of these points being attached to a carrier in connection with one of the tubes, is by its motion kept in its proper relative position with respect to the other electrode. The current governor consists of a glass globe containing a saline solution, mixed with sulphuric acid, through which the current has to pass. The distance between the extremities of the wires which communicate with the globe can be varied, so that the current will have to pass through a greater or less space in the globe according to the position they occupy, and can be thereby governed at will. An indicator is attached to the apparatus to show the power of the battery current.

The *third* part of the invention consists of an improved form of battery, with porous cells and gutta percha troughs, and excited by a saline solution mixed with sulphuric acid, by the employment of which the zinc plates, when such are used, do not require to undergo the process of amalgamation.

Claims.—1. The use of the regulator for regulating the electrodes, and the arrangements by which electricity or magnetism is caused to actuate the said regulator; and, instead of a consumable electrode a non-consuming electrode can be used, and the governor meter or electric current indicator may also be used in connection therewith.

2. The general arrangement and combination of the battery, and its appurtenances; also the formation of the porous cells; the use of gutta percha for the small troughs; and the use of salts in the said battery, combined with equal parts of sulphuric acid, without amalgamation with mercury in the said porous cells, for the purpose of obtaining electric currents.

William Boggett, of St. Martin's-lane, Westminster, gentleman, and George Brooks Pettit, of Lisle-street, Westminster, gas engineer. *For improvements in obtaining and applying heat and light.* Patent dated October 21, 1852.

This invention includes a variety of arrangements for lighting and heating by gas, or gas commingled with atmospheric air. Amongst these are improved burners, stoves, gas fires for open grates, baths, &c., some of which we shall take the opportunity of noticing in a future Number.

James Lamb, of Kingsland, Middlesex, gentleman, and Joseph Menday, of the same place, engineer. *For improvements in the construction of kilns for burning or calcining cement, chalk, limestone, and other substances requiring such process, and in the application of the heat arising therefrom to the generation of steam.* Patent dated October 23, 1852.

These improvements consist in constructing cement kilns in such a manner as to take advantage of the heat now lost by radiation for the purpose of generating steam. With this view the patentees adapt to the interior of their kilns a water chamber of an annular form, which is let into the wall of the kiln, so that the spare heat of the materials under calcination may be absorbed by the water contained therein, and steam produced, which may be applied to any purpose for which it may be required. The annular chamber may have a flue on that side not exposed to direct heat, and an additional furnace may be provided in connection with that flue, for the purpose of maintaining the temperature of the chamber at an equal rate; the sides of the chamber may also be connected by tubes running across the bottom of the kiln.

Claim.—The construction of kilns for burning or calcining cement, &c., in the manner described, so that by the adaptation thereto of a water chamber, steam may be generated by the spare heat of such kiln and applied to any purpose requiring the same.

Robert McGavin, of Glasgow, Lanark, N.B., merchant. *For improvements in the manufacture of iron for shipbuilding.* Patent dated October 23, 1852.

The object of this invention is the preparation of iron plates for shipbuilding purposes, in such manner that the adherence of barnacles may be prevented, and this is accomplished by mixing with the iron, during the process of manufacturing, as large a proportion of arsenic (white or yellow) as it will take up without deterioration in strength and tenacity. This proportion will generally range between 2 and 5 per cent., according to the quality of iron used. The arsenic is preferred to be introduced in the puddling process, but it may also be applied between the surfaces of blocks of iron previous to the rolling, and, in addition, a further quantity is sprinkled on the surface of the heated plates towards the completion of the process. When rolled, the plates are scoured with acid, rubbed smooth with holystone, and then immersed in a bath of melted spelter, lead, tin, or zinc, mixed with arsenic.

Claims.—1. The application and use of arsenic in the treatment or manufacture of iron for shipbuilding.

2. The system or mode of preventing the adhesion of animal matters to iron surfaces by incorporating arsenic in such iron.

Henry Needham Scrope Shrapnel,

of Gosport. *For improvements in extracting gold and other metals from mineral and earthy substances.* Patent dated October 23, 1852.

Captain Shrapnel's improvements (which we have already noticed, *ante* p. 125) consist in reducing and pulverizing ores containing gold and other metals, by discharging them from a gun or cannon into a chamber lined with sheet iron, the back of which is preferred to be of a concave form. The force of the impact of the materials against the iron plate reduces them to a fine powder, and the metal is afterwards extracted by any of the ordinarily practised methods of proceeding. Instead of gunpowder or other explosive compound, steam may be used to project the materials to be pulverized.

Specification Due, but not Enrolled.

William Reid, of University-street, electric-telegraph engineer. *For improvements in electric telegraphs.* Patent dated October 21, 1852.

PROVISIONAL PROTECTIONS.

Dated March 18, 1853.

672. George Rock Lucas. Improvements in the method of raising water and other materials from mines.

Dated April 5, 1853.

809. William Willcocks Sleigh. The production of motive power, which he entitles "the counteracting reaction motive-power engine."

813. John O'Connor. The manufacture of coke from raw peat.

Dated April 8, 1853.

848. William Ford Smith. An improvement in certain vessels or utensils for heating liquids.

Dated April 18, 1853.

931. Richard Ford Sturges. A new or improved apparatus for making vegetable and other infusions and solutions.

933. William M'Naughton. Improvements in printing yarns or worsteds for weaving carpets, also in printing carpets, woollen, silk, cotton, and other textile fabrics or fibrous substances.

935. William Fawcett and Francis Best Fawcett. Certain improvements in the manufacture of carpets.

937. Jean Jules Gosle. Improvements in disengaging silk of its gum.

Dated April 19, 1853.

939. Thomas Newey. Improvements in fastenings for articles of dress.

941. Lambert Adolphe Beauvain. Improvements in machinery for obtaining wool, silk, and fibres from fabrics, and rendering them suitable to be again employed.

945. Christian Böringer and Gustavus Clemm. Improvements in the manufacture of soda and potash.

949. Andrew Blair. Improvements in propelling vessels.

Dated April 20, 1853.

951. Samuel Wright. Improvements in ventilating mines, sewers, or drains, ships, buildings generally, and other localities.

953. Henry McEvoy. Certain improvements in the construction and manufacture of door bolts.

955. Richard Archibald Brooman. Improvements in inhaling-tubes. A communication.

957. Sir William Snow Harris. Improvements in lightning conductors for ships and vessels.

Dated April 21, 1853.

963. James Petrie. Certain improvements in steam engines.

965. William Robjohn. An improved meter for measuring and indicating the measure of liquids.

967. William Edward Newton. Improvements in machinery for bending wood or other materials. A communication.

Dated April 22, 1853.

968. Thomas Freeman Finch. Improvements in buttons.

969. James Davis. Improvements in the manufacture of thrashing-machines.

970. William Sager. Certain improvements in machinery or apparatus for propelling vessels.

971. William Hunter. Improvements in cutting and planing wood and other substances.

972. William Asquith and Joseph Asquith. Cleansing, preening, and removing wool flocks, waste, and refuse from the cards, teazles, cylinder, raising gig, and machinery used in the dressing of woollen cloths.

973. William Beard. Improvements in needles, and in the manufacture of the same.

974. Cyprien Marie Tessie du Motay. Improvements in preparing oils, and in apparatus for burning the same.

975. Jerome André Dries. Improvements for cutting the pile of velvet, velveteens, and other piled fabrics.

Dated April 23, 1853.

976. Edward Onslow Aston and George Germaine. Improvements in compositions for coating wood, metal, and other materials exposed to the action of sea-water or the weather.

978. Thomas Knowles. Improvements in the machinery or apparatus for picking warps.

979. Frederick John Wilson. An improved wheel-barrow.

982. James Geddes. Improvements in oars.

983. William Johnson. Improvements in machinery for combing wool or other fibrous materials. A communication.

984. James Napier. Improvements in separating certain metals from their ores and alloys, and for obtaining certain products therefrom.

985. George Fergusson Wilson, William Henry Hatcher, and John Jackson. Improvements in apparatus for manufacturing moulded candles.

986. Richard Johnson. Improvements in machinery or apparatus for drawing wire.

Dated April 25, 1853.

987. Edward O'Connell. Improvements in the mode or method of feeding infants, and invalids, and in apparatus connected therewith.

988. Henry Elliot Hoole. A self-acting speed-regulator and safety-break for railway carriages.

989. Charles Léon Desbordes. Improvements in instruments for measuring the pressure and temperature of air, steam, and other fluids.

990. John Chatterton. An improvement or improvements in covers for wagons, carts, and other vehicles.

991. Robert Davies. An agricultural reaping-machine.

992. William Tillie and John Henderson. Improvements in printing shirting fabrics.

993. James Emery. Improvements in the construction of gigs, dog-carts, and other vehicles.

994. William Johnson. Improvements in the means of retarding and stopping railway trains. A communication.

995. Julian Bernard. Improvements in casting metals, and in moulding or forming other materials.

Dated April 26, 1853.

996. Isaac Brentnall Sheath. Certain improvements in fire-arms.

997. Jacques Emile Joffriaud. Certain improvements in machinery or apparatus for washing earths containing gold extracted from the bottoms of rivers or other waters.

998. George Kennedy Geyelin. Improvements in the manufacture of white oxide of zinc.

1001. John Pym. Improvements in building-materials.

1002. Auguste and Jean Le Roy and Eugene Paty. Improvements in the production of lace and other fabrics.

1003. Uriah Scott. Improvements in the manufacture of tubular rods and rings for furniture

1004. Moses Poole. Improvements in the manufacture of porcelain and like wares. A communication.

Dated April 27, 1853.

1005. William Johnson. Improvements in machinery for preparing and spinning cotton, and other fibrous substances.

1006. Frederick George Underhay. Improvements in reaping and mowing-machines.

1007. George Ferdinand de Fonveille. A filtering-machine, which acts under water, and is applicable to the filtering of all liquids.

1008. Benoist Marie Adolphe Langlois. Improvements in instruments to be applied to the chimneys of gas-burners. Partly a communication.

1010. John Hetherington, John Dugdale the younger, and Edward Dugdale. Improvements in constructing and applying models or patterns for moulding, preparatory to casting iron, brass, and other metals for various purposes.

1012. Richard Howson. Certain improvements in weavers' harness. A communication.

1013. John Henry Johnson. Improvements in apparatus for sustaining bodies in the water. A communication.

1014. Joseph Walter Gale. Improvements in the permanent way of railways.

1015. William Johnson. Improvements in machinery or apparatus for marking, ruling, or ornamenting surfaces. A communication.

1016. George Turner. Improvements in the manufacture of unfermented bread, which improvements are also applicable to other purposes as a substitute for yeast.

1017. George Critchley. An improved apparatus for regulating the heat and supply of water in hot-water apparatus.

1018. Joseph Palin and Robert William Sievier. Improvements in distillation, and in apparatus connected therewith, which apparatus is also applicable to other purposes in which substances are to be treated by the assistance of a vacuum.

1019. Samuel Groves. Improvements in pneumatic apparatus for pumping or forcing air.

1020. James Andrew Bruce. Certain improvements in the construction of hay-racks, and other apparatus or apparatuses to contain fodder for horses and other cattle, and also in the method or methods of fastening horses or other cattle, to prevent their overcasting.

1021. Thomas Culpin. Improvements in steam boilers, and in the appendages thereto.

1022. Wellington Williams. A new combination of materials suitable for the manufacture of boxes, cases, trays, and other like articles.

1023. William Reid. Improvements in apparatus for testing the insulation of electric telegraph wires.

1024. Richard Jordan Gatling. Distributing power to machine-shops, factories, and other places.

1025. John Filmore Kingston. Improvements in galvanic or voltaic batteries.

1026. William Frederick Thomas. Improvements in apparatus for sewing or stitching.

Dated April 28, 1853.

1028. Joseph Hetherington. Certain improvements in reels for reeling or winding yarns.

1030. Edward Bird. An improvement or improvements in the construction of certain kinds of vehicles.

1034. Sir John Scott Lillie. Improvements in roads, floors, footways, and other like surfaces.

1036. Thomas Revis. Improved single-seed drilling or dibbling machinery.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," May 6th, 1853.)

1009. William Allchin. Improvements in agricultural and other steam engines.

1060. William Edward Middleton. A new or improved lubricator. A communication.

1067. Charles James Wallis. Improvements in machinery for amalgamating, mixing, and grinding substances together.

(From the "London Gazette," May 10th, 1853.)

972. Charles Alfred Jordery. Improvements in the construction of the bodies of cravat-collars and stocks and stiffeners, and in the ornamenting of cravat-collars and stocks in general.

976. John Norman. Improvements in the mode of making and setting the square sails of ships or vessels of any size and description.

980. Thomas Conolly and William Cotter. Improvements in propelling vessels.

1073. André Caintry. Improvements in the manufacture of bread and biscuits.

1098. George Thomson. A machine for cutting wood.

1141. Alfred John Hobson. A new or improved metallic bedstead.

25. Charles Frederick Whitworth. Improvements in apparatus to be used in connection with railway signals for the purpose of indicating the approach of trains, and of preventing collisions.

221. Richard Archibald Brooman. Improvements in cables. A communication.

456. Edwin Stanley Brookes, Joseph Black, George Stephenson, and William Jones. Improvements in machinery for the manufacture of looped fabrics.

636. Bennett Alfred Burton and Henry Mortimer Burton. Improvements in the mode of manufacturing casks, vats, and other like vessels, and in the machinery or apparatus to be employed for such purpose.

672. George Rock Lucas. Improvements in the method of raising water and other materials from mines.

704. Henry Henson Henson. An improvement or improvements in buffers.

707. Jean Baptiste Masset. Certain improvements in the manufacture of knives, and other similar handle instruments.

778. John Smedley. Improvements in ma-

chinery or apparatus for opening, cleaning, blowing, or scutching animal wool, cotton, or other fibrous substances or materials.

827. William Radford. Improvements in the construction of metallic beams or bracings, and metallic sheets or plates, applicable to the building of ships and other structures where lightness and strength are required.

858. Adolphe Marius Alexandre Iglesia. Improvements in producing ornamental glass surfaces.

861. John Fuller Boake and John Reily. Improvements in signal-posts for railways and apparatus connected therewith.

870. Samuel Russell and Robert Murray M'Turk. Improvements in metallic handles for table cutlery, daggers, and such like instruments.

874. Henry William Harman. Improvements in steam engines.

884. Alfred Vincent Newton. Improvements in steam boilers, and in the mode of supplying the same with water. A communication.

889. Thomas Edwards. Improvements in steam engines.

890. James Noble. Improvements in preparing cotton and other fibres.

893. William Renwick Bowditch. Improvements in purifying water.

894. James Noble. Improvements in preparing cotton and other fibres.

895. Charles Clifford. Improvements in apparatus for lowering boats evenly, and preventing them filling with water.

929. William Walker Stephens. The application of retorts in gas ovens or other ovens, and of gas ovens or other ovens which are constructed as retorts, to the process of improving iron, and converting iron into steel.

941. Lambert Adolphe Beauvain. Improvements in machinery for obtaining wool, silk, and fibres from fabrics, and rendering them suitable to be again employed.

946. Christian Behringer and Gustavus Clemm. Improvements in the manufacture of soda and potash.

961. Juan Duran. Obtaining and applying motive power.

962. Henry Carr. Certain improvements in the construction of railways.

963. James Petrie. Certain improvements in steam engines.

965. William Robjohn. An improved meter for measuring and indicating the measure of liquids.

970. William Sager. Certain improvements in machinery or apparatus for propelling vessels.

974. Cyprien Marie Tessie du Motay. Improvements in preparing oils, and in apparatus for burning the same.

984. James Napier. Improvements in separating certain metals from their ores and alloys, and for obtaining certain products therefrom.

985. George Fergusson Wilson, William Henry Hatcher, and John Jackson. Improvements in apparatus for manufacturing moulded candles.

995. Julian Bernard. Improvements in casting metals, and in moulding or forming other materials.

996. Isaac Brattnall Sheath. Certain improvements in fire-arms.

997. Jacques Emile Joffriaud and Rodolphe Riviere Miner. Certain improvements in machinery or apparatus for washing earths containing gold extracted from the bottom of rivers or other waters.

1004. Moses Poole. Improvements in the manufacture of porcelain and like wares. A communication.

1006. Frederick George Underhay. Improvements in reaping and mowing-machines.

1007. George Ferdinand de Fonvielle. A filtering machine, which acts under water, and is applicable to the filtering of all liquids.

1008. Benoist Marie Adolphe Langlois. Improvements in instruments to be applied to the chimneys of gas-burners. Partly a communication.

1009. Samuel Plimsoll. More thoroughly and effectually cleansing, extracting, and separating or fining ale, beer, porter, bitter beer, India pale ale, and other malt liquors from the yeast, bottoms, barm, sediment, and other extraneous matters and impurities with which it may be in combination.

1014. Joseph Walter Gale. Improvements in the permanent way of railways.

1017. George Critchley. An improved apparatus for regulating the heat and supply of water in hot-water apparatus.

1023. William Reid. Improvements in apparatus for testing the insulation of electric telegraph wires.

1024. Richard Jordan Gatling. Distributing power to machine shops, factories, and other places.

1026. William Frederick Thomas. Improvements in apparatus for sewing or stitching.

1034. Sir John Scott Lillie. Improvements in roads, floors, footways, and other like surfaces.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1009. Samuel Plimsoll, of Fullwood, Upper Hallam, Sheffield. More thoroughly and effectually cleansing, extracting, and separating or fining ale, beer, porter, bitter beer, India pale ale, and other malt liquors from the yeast, bottoms, barm, sediment, and other extraneous matters and impurities with which it may be in combination. April 27.

WEEKLY LIST OF PATENTS.

Sealed May 6, 1853.

1852:

658. John Ryall Corry and James Barrett Corry.

668. Charles Frederick Day and John Layleer.

Sealed May 7, 1853.

670. Charles Troupeau.

688. George Shadforth Ogilvie.

693. William Tudor Mabley.

890. Mathurin Jean Prudent Moriceau.

917. John Brannis Birch and Eugenius Birch.

1103. Edward Schischkar.

1104. Edward Schischkar.

1196. James Power.

1853:

59. Francis Parker and William Dicks.

159. Reuben Plant.

608. John Powis and Jabus Stanley James.

620. John Gilby.

Sealed May 9, 1853.

1852:

690. John Down Gordon.

Sealed May 10, 1853.

703. Auguste Baboneau.

717. William Davis.

Sealed May 11, 1853.

718. William Edward Middleton.

723. Daniel Henwood.

724. Charles Seaton.

732. Robert John Smith.

801. John Trestrail.

803. James Nasmyth.

809. William Green.

847. Henry Thomson.

853. Stephen Spalding.

860. William Hall.

953. Richard Archibald Brooman.

1853:

461. Asa Willard.

570. Joseph John William Watson.

616. Francis Preston.

651. Charles Heard Wild.

667. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
May 7	3457	Stock and Sons	Birmingham	Water-closet and Service-box.
10	3458	D. Salomons	Great Cumberland-place.	Railway and Steamboat signal.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

May 9	507	J. Steiner	Birmingham	Dress-fastener.
,,	508	H. Bridger	Chelsea	Boot-scraping and brushing-machine.
12	509	S. Myddleton	London	Gumming machine.
,,	510	C. Osborne	Camberwell	Expansive winder.

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Mechanics' Magazine.

No. 1554.] SATURDAY, MAY 21, 1853. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

HUGHES AND DENHAM'S PATENT RIBBON, FRINGE, AND CHENILLE MACHINERY.

Fig. 2.

Fig. 1.

HUGHES AND DENHAM'S PATENT RIBBON, FRINGE, AND CHENILLE MACHINERY.

(Patent dated November 5, 1852.)

The machinery described in this patent, and which the accompanying figures represent, applicable to the manufacture of fancy ribbons, ornamental trimming, chenilles, fringes and gimps, and has for its object the production of the above description of goods without the aid of weaving, or weaving machinery, at the same time giving to such articles all the appearance of having been woven. By means of this machinery a great deal of labour is saved in the production of such articles, and it also effects a large economy of time, and they are produced with great rapidity.

Figure 1 is a side elevation; fig. 2, a front elevation of a machine constructed according to our invention. A A, is the general framework, cast in a piece with the sole-plate, A^1. B is the main driving-shaft, by which the whole of the working parts of the machine are set in operation. This shaft, B, is mounted in the framework, A A, and has keyed upon one end of it the fly-wheel, B^1, which may be set in motion either by a crank-handle or by steam power. A^2 is a bevel-wheel keyed upon the shaft, B, which gears into a bevel-pinion, C, on the shaft, C^1, mounted in the cross-bars, C^2, C^3, which are screwed to the two uprights, A A, of the framework. D is a spur-wheel keyed upon the shaft, C^1, which gears into the toothed-pinion E, upon the shaft E^1, supported and turning in the bracket C^3, and bearing, C^4. The other end of the shaft, E^1, carries a bevel-wheel, F, which gears into a corresponding bevel-pinion, G, upon the shaft, G^1. This shaft, G^1, is supported in the framework, A A, and has cut upon it the screw-threads, *a a*, as far as the shoulder, *b*, which is formed upon the shaft. H H are cams shaped out of discs of sheet steel. They are mounted upon the shaft, G^1, and are kept apart from each other, at their proper distances by the washers, *c c*, interposed between them. I I are nuts, tapped to correspond with the screwed portion, *a a*, of the shaft, G^1, which keep the cams, H, in their assigned position, and also admit of an easy adjustment of the cams by interposing broader or narrower washers. The shape of these cams can be varied to suit the different kinds of work to be produced. K K are guides, which are free to slide backwards and forwards in the guide-bars, K^1 K^1, when acted upon by cams, H H, there being one guide to each cam. One end of each of these guides is formed with a projecting piece, or tooth, *d*, which takes into the hollow parts of the cam, the guides being in a direct vertical line with the centres of the cams, as seen by fig. 2. The other end of each of the guides is brought to a sharp round point for a purpose which will presently be described. L L are brass guides fixed to the guide-bars, K^1, and projected forward into the centres of the rollers, M, N. The front of these guides is curved, and slotted out in front, so as to allow of the points of the shifting-guides, K, being alternately pushed out beyond the centres of the roller by the action of the cams, H, upon the projecting tooth, *d*. These points are again withdrawn by means of India-rubber, or other springs, *e e*, of which one is attached to each guide, K, and also to the framework. The rollers, M, N, are mounted in brasses in the framework, and are cut away on each side of the centre parts, M^1, N^1, so as to admit of the forward action of the guides. P is a toothed rim in gear with the spur-wheel, D, and supported and retained in its position by the four friction-rollers, P^1, P^2, P^3, P^4. Its edge is grooved to receive the edges of the friction-rollers, which are turned for the purpose. Q Q are the bobbins, which are attached to the rim, P, and revolve with it. The action of this rim, P, in its revolution, is to carry round the bobbins, Q, and so cause them to lay their threads around those two of the projecting points of the shifting-guides, K, which may be by the action of the cams thrust forward to receive them. These projecting points must be so arranged as to act in pairs, one point being thrust forward on each side of the centre parts, M^1, N^1, of the rollers, M, N. The guides, L L, first receive the thread as the ribbons revolve, and from their front edges being of a conical shape, the thread slips down upon the points of the shifting guides, which are protruded forward, and is by them carried into and between the centre of the rollers, M, N. The method of driving the rollers is accomplished by means of a pinion, R, keyed upon the main driving-shaft, B. This pinion, R, gears into the intermediate toothed-wheel, S, which is supported and turns in the forked-lever, S^1, by which it can be adjusted. The wheel, S, gears into, and imparts motion to the spur-wheel, T, on the axis of the centre-roller, N. U is a pinion, also upon the same axis as the wheel, T, and which gears into the toothed pinions, V and W; the pinion, V, being upon the lower roller, M, and the pinion, W, upon the axis of the upper roller, O. X X are two other rollers covered with

India-rubber, and driven by the pinions, Y Y^1, from the intermediate wheel, Z, in gear with the pinion, W. O^1 are set screws, which bear upon brasses of the rollers, O, N, M, by which the necessary distance between these rollers can be regulated, so as to suit the various articles passing between them. *f f* are a series of guide-holes, through the guide-bar, K^1, for the purpose of introducing a number of threads into the centre of the work to be formed. These threads are moistened with gum, or any other suitable adhesive composition, and form the ground of the work, being fed into the machine at right angles to the threads laid by the bobbins, Q Q. These ground threads may be made of wire covered with cotton, and moistened with adhesive composition; or strips of paper, or any textile fabric may be fed into the machine, and covered with silk, or other kind of thread, according to the pattern desired. *g* is a tube in connection with a gas-pipe, which is continued across the machine, and is pierced with a row of holes to allow of jets of gas to burn beneath the rollers, O, N, M, and so impart a sufficient quantity of heat to give the requisite set to the fabric passing between them. *h h* are plates, placed in front and above the jets of gas to prevent the flame from injuring the silk.

The action of this machine is as follows:—The fly-wheel, B^1, being driven by the crank handle, B^2, imparts motion to the main driving shaft, B, and through it by the intervention of the gearing above described to the cams, H, the guides, K, the rim, P, and the bobbins, Q, and also to the rollers, M, N, O, and X X. The result of these motions is to cause the bobbins to wind the threads round the conical guides, L, from which they slide down on to that pair of points which may be protruded forward by the cams, H. These points serve to lay the thread between the surfaces of the rollers, MM, and also around the ground threads which are consequently in the centre of the article being formed. They also determine the width of the article, as the action of the cams constantly varies the width between the points, by protruding other pairs closer to or farther from each other; thus producing a fabric with variegated edges. The rollers, M, N, being heated by the gas, as before described, serve to give the requisite set to the fabric passing between them, by drying the adhesive composition on the ground threads, and causing them to adhere firmly to the transverse threads laid by the bobbins, Q. The fabric, after leaving the rollers, M, N, is carried over the roller, O, for insuring the set-off, and more perfectly drying the fabric. From the roller, O, the fabric is carried through the rollers, X X, from which it is wound upon bobbins, or made up into the requisite articles for sale.

In making fancy ribbons, it will be desirable that they should, after leaving the machine, be dressed in the ordinary manner for giving the necessary finish to them. For this sort of manufacture, or in the manufacture of other articles with plain edges, cams, H, must be thrown out of gear by displacing the toothed-wheel, E, and by substituting other guides for the guides, L, which may be made to suit the required width of fabric. Ornamenta. trimmings may be produced, by feeding into the machine as the ground, strips of tarlatan, muslin, satin, silk, or quilling, and winding round them from the bobbins. Q, various coloured threads, in conjunction with the shifting-guides, K, or not, as desired. It will be necessary to make use of one, two, or more ground-threads, moistened with adhesive composition, to secure the whole fabric together.

For the manufacture of chenille, fringes, gimps, and similar fancy articles, it is necessary to attach a knife to the rollers, O, M, N. Instead of employing threads for the ground-work of this class of fabrics, the patentees in this machine use wire, covered with thread, and saturated with adhesive composition. These wires are fed into and between the rollers, M N, which are grooved to receive them through holes in the guide, L. The knife is so fixed in reference to the rollers, that as the fabric is brought over the roller, O, it divides it up the centre, the wire in the grooves, *i i*, keeping the fabric tight as it passes to the knife. The fabric as thus divided forms a fringe, which can afterwards be spun into chenille or other various forms of fancy articles.

Figs. 3 and 4 are respectively a side elevation and an end view of an apparatus for spinning into chenille the fabrics formed by the machine represented in figs. 1 and 2. A is a sole plate; B B are two standards, or uprights; C is a disc, or pulley, which is centred upon the hollow axis, *a*. This disc, C supports a number of bobbins, D D, arranged in a circle, and on which are wound the fringes or other class of articles intended to be spun. The axis, *a*, is made hollow, in order to allow a wire, thread, or other suitable substance being fed through from off the bobbin, E. This wire or thread is to form the ground or mandril around which the work is to be wound. Should it be desired, a mandril of greater thickness may be substituted when making velvet piping or hollow chenille. The mandril will necessarily be of various shapes, such as round, flat, or polygonal, so as to produce chenilles of a great variety of forms and patterns. F F are pulleys which are made with deep grooves, to insure the pile being kept straight as it is wound upon the ground-thread or mandril, and to prevent it from being entangled with the ground or

selvage. G is an endless band upon the rollers, H H, for determining the closeness of the pile of the article, according to the rate at which it travels, its speed being regulated by the conical pulleys, I, I, by which it is driven. K is a pulley on the hollow axis, *a*, for giving motion to the disc, (C), and bobbins, (D), by means of an endless cord from the cord-wheel, L, supported in the standard, M, and driven by the handle, N. Upon turning the handle, N, the disc and bobbins will be made to revolve, and with them the endless band, G. The attendant should then take hold of the wire or thread from the bobbin, E, and draw it through the hollow axis, *a*, when work is formed upon it. When a sufficient quantity has been thus commenced, the attendant brings it forward, and with the thumb and finger holds it together with the endless-band, which, as it travels forward, determines the closeness of the work laid by the bobbins. The fabric on the bobbins is guided on to and around the mandril, by the notched-guide, *b*, there being one notch for each bobbin, so as to keep the fabrics distinct and separate from each other, and also to insure the perfect formation of the article. The wire or thread forming the ground or mandril may be either left in or drawn out as desired.

Fig. 3.

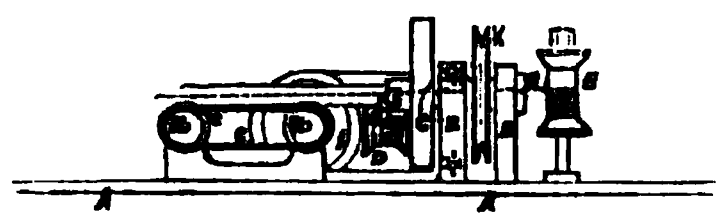
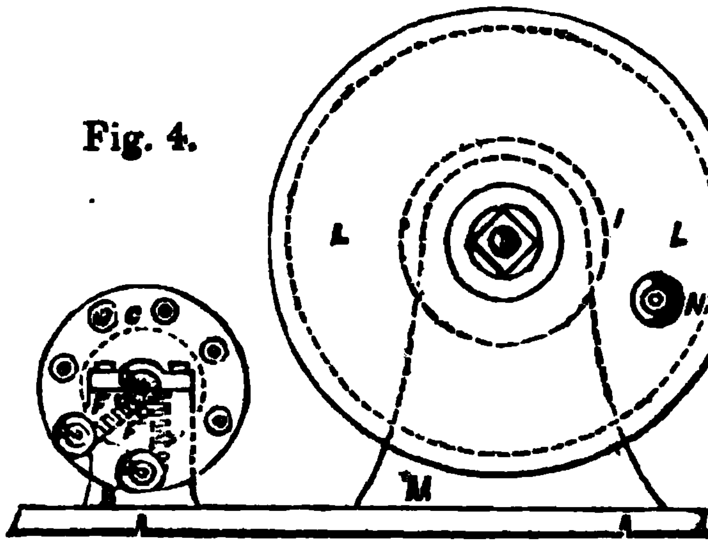


Fig. 4.



Instead of spinning up silk or thread fabrics from off the bobbins, wire, covered with silk or thread, or left uncovered, may be spun up into gimps, bullion trimmings, fringes, and other fancy and ornamental fabrics; or fabrics may be composed of part silk, wool, cotton, or other suitable material, combined with wire, and spun up into a great variety of patterns; and by diversifying the colours of the threads, fabrics of various colours may be produced, according to the taste of the manufacturer.

PETRIE'S PATENT GOLD-REFINING PROCESS.

(Patent dated November 13, 1852.)

The new method of conducting the refinement of gold, described by Mr. Petrie in the specification of his patent, is directed to the improvement of the process termed "parting," and exhibits another application of a valuable principle of operation, to which he has given the appellation of "differential." The general nature of this principle we explained, when noticing in a recent Number his new sulphuric acid manufacture; and we shall now have occasion to describe it more in detail. He also employs the gradient arrangement of apparatus, and electric precipitation.

According to the specification, the "refiner's alloy," consisting of one part of the impure gold and three parts of silver, granulated in the usual manner, is first placed in a series of six or more small cells or cylinders, which are placed upright in beds, or cradles, resting upon and between two parallel rails which form an incline, and, if desirable, these can be made to form the sides of a flue, whereby the cells are warmed whilst in action; or without the flue, the cradles may be of nonconducting material, and surround the cells, to maintain the heat. Hot nitric acid is kept continuously dropping from a tap into the highest cell, and having passed down through the whole

mass of the alloy, and through a perforated false bottom, ascends through a tube, or at the opposite side of a diaphragm fixed vertically in the cell, to a lip at the top part. From this it overflows, and drops off the side into the next cell on the incline, which stands upright close to it, but about two inches lower. The nitric acid thus makes its way through this arrangement of successive cells, which is termed a "gradient series." From time to time a new cell, containing fresh alloy, is added in a cradle, to the bottom of the series, which is then moved bodily up the incline, by a simple and suitable mechanism, through the space occupied by a single cell; so that each cell is made to move into the position occupied by the one previously next above it, and the upper cell is removed. This process being continued, it is clear that each cell gradually travels up the incline, while the nitric acid moves downwards through them; and thus each cell, with the alloy which it contains when first put on the incline, receives the nitric acid after it has descended through all the others, and becomes partially saturated with silver. This liquor, however, is still sufficiently active to operate on the fresh alloy, the surface of which is rich in silver; and if it contained a greater proportion of free nitric acid, it would pulverize the gold itself, by acting too energetically on the fresh alloy. Refiners obviate this in the ordinary process by using a weak aqueous solution of nitric acid to remove the first portions of silver from the alloy, and then dissolving the remaining portions of silver, which are more difficult of solution, by a second and distinct operation, with stronger acid. A much more perfect adjustment of the energy of the acid to the state of the alloy is obtained in every stage of the "parting," by Mr. Petrie's patent "differential" mode of bringing the acid and the alloy into contact; a mode which has, moreover, the merit of being a single and continuous process, in which, as we have seen, the alloy moves upward and encounters stronger acid, just in proportion as the alloy loses its silver, and so the less easily parts with what remains of it, until at length the alloy reaches the top of the series, where its last traces of silver encounter the acid in its freshest and strongest state, rinsed out by it, and leave the pure gold behind. On the other hand, the nitric acid leaves the series at its lower end most nearly saturated with silver. This completely effective action is secured with the utmost economy of acid, and not by dint of using the large excess of acid which would be necessary to do the work with equal efficiency by the ordinary process.

The peculiar nature and advantages of the general principle of differential action, of which we here have a good example, are fully defined in the specification of the patent. Its general object is the effecting of a change in two things by their mutual action, when portions of them are brought into contact gradually and successively, by making them pass through one another in opposite directions. The result of such an arrangement necessarily is, that at every point along the line of action they meet one another only in such relative states that their action on each other is but slight; but the action being continuous and progressive, they emerge at opposite ends with contrary changes effected in each to the greatest degree. By the ordinary modes, on the contrary, of bringing such materials into contact with a view of effecting mutual changes, the completeness of the change in one of the materials can only be gained by expending an excess of the other material, and so foregoing the completeness of its change.

As the cells containing the refined gold in its spongy state are removed from the top of the differential gradient series, they are placed at the bottom of a new series exactly similar,—excepting that instead of nitric acid, water is continuously dropped in at the upper end. By this means, the remaining acid and salt of silver is rinsed out; and this being done differentially, the rinsing is most complete, at the same time that the adhering acid and salt are withdrawn from the gold with the least possible dilution of water.

In the next stage of the process, covers are fitted to the first-named series of solution-cells, to confine the nitrous fumes arising from them. These covers fit loosely, but internally, so as to trap the gas by the acid itself within the cell, thus securing the useful principle of the water-lute without its complication. The fumes are thence conducted, by stoneware tubes, through an apparatus called a gas-collector, into an oxydator. There are some novelties in the arrangements of these subordinate parts, and no luting is needed. The fumes are drawn off by an internal suction from the end of the oxydator, so that any imperfect or loose fittings in the parts are a positive advantage, by improving the oxydation, instead of being fatal to the efficacy of the apparatus, and causing a nuisance from the escape of the fumes, as is the case in similar arrangements which have been lately proposed in some other departments of chemical art.

The patentee does not claim the general application of the principle of the oxydator, but the apparatus he specifies and claims is

altogether new, and an improvement on existing means. It consists of a column of hollow stoneware cylinders of an improved shape, filled loosely with coarse rounded silicious sand, having its grains of a uniform and particular size, to secure the utmost effect with the smallest apparatus. The specification describes a definite rule for determining what this size should be in any particular case. The sand may be so obtained by means of one of the recent gold-washing machines, for which a new use is thus found. New arrangements are described also for admitting the fumes and air at the lower part of the column, and for securing a slow and uniform dispersion of water over the upper surface of the sand. A draught of suction is at the same time created (as by connection with a powerful chimney-draught), which draws the fumes through the apparatus, and re-converts the whole of the fumes into strong nitric acid, which flows out from beneath in a continuous stream, ready for further concentration or for immediate use. The sand, being prepared as specified, does not arrest the draught as ordinary sand, or even gravel or a coarser-crushed material would succeed. The peculiar combining powers of the solid silicious surface in contact with air and water,—by which means the most extensive oxydating effects are produced in nature,—are developed in this apparatus to a great extent; for the combining surface of the grains in a cylindrical apparatus 12 feet high and 1 foot diameter is several thousands of square feet; and this is kept in a state of the utmost chemical activity by the direct impinging of the gases against it, by the motion of the water in the contrary direction, and by the thinness of the film of the water between the combining surface and the gases. The vent of the draught from the apparatus is stated to be practically inoffensive. There are various useful details specified by the patentee, which we propose, from want of space, to reserve for our next Number; but in this part of the apparatus, as in the previous parts, he lays much stress on the importance of those arrangements whereby the gases and the water are brought into contact on the differential principle, for the purpose of securing, by a comparatively small apparatus, the economy of a pure vent, with the least possible dilution of the acid produced.

THE TRADES OF BIRMINGHAM.

The briskness of the machine manufacture in Birmingham may be judged of by the fact that the die-sinking and casting business was never known more active than at the present time. Immense marine engines are in course of construction, and the railway and other companies requiring heavy scientific machinery, afford abundance of work at the present moment to the great firms in South Staffordshire—Fox and Henderson, the Soho Works, Messrs. Cochrane and Johnson, and others.

Letters received from Melbourne speak most encouragingly of some branches of the Birmingham trade; but of others the accounts from the Australian market are not so favourable. A long list of articles of Birmingham manufacture most in request has been supplied to many of the merchants, and from this it appears that edge tools, agricultural implements, brassfoundery, cutlery, and firearms of every description are most sought for; but the supply of hollow ware has been more than the market required. Tin ware is also in great demand, and saddlery, more particularly cart-harness, is required to an immense extent. These branches of business are consequently extremely busy in Birmingham, and large orders are continually pouring in from the Liverpool exporters. In pistols the demand is chiefly for Dean's revolver, which is not much more than half the price, and almost equally as efficient as that made under Colt's patent. A brace of pistols, according to accounts and orders received, is a necessary appointment for every emigrant to the Australian colonies.

In another column will be found a brief notice of a new manufacture which has arisen in Birmingham, under Morris and Johnson's patent for depositing on metallic surfaces the alloys of a variety of metal, regulating according to desire the thickness, and the tint of the coating. Some fine examples of this description of work have been turned out of hand, and have attracted considerable notice.

It is remarkable that, notwithstanding the price of the raw material which, although reduced, still continues comparatively high, generally the braziery trade is extremely brisk; and in some branches there is a difficulty in obtaining workpeople. The columns of the local newspapers, which teem with applications for competent workmen, exhibit the strongest evidence of its activity and that of the copper trade; but still it is considered that the stock of ore within the kingdom, joined with the large quantities expected from Russia and other countries, does not justify the owners of mines, or the copper merchants, in exacting the present high rates paid by the manufacturers of brass and copper goods. It was very generally rumoured in the early part of the week that a further reduction would

be announced in the price of copper. The large sales recently effected in Cornwall, and the determined manner in which the late advance was resisted by the manufacturers, together with the discovery and opening of new mines, induces generally the belief that present quotations cannot long be maintained. In the course of the present week a meeting of some members of the copper trade has been held in Birmingham, at which it was determined to advance the discount allowed on manufactured articles, (that is, lowering the price) 5 per cent.

The differences which have arisen between the master and operative builders of Birmingham with regard to wages and time, are not likely to be settled in the amicable manner which was anticipated. The price of labour is now, indeed, becoming a question of interest and discussion among the various trades of Birmingham, and, from all appearance, a combined movement in favour of an advance is not far distant. In some few branches advances have already taken place.

THE IRON TRADE.

There has been little alteration in the state of the iron market during the past week. For manufactured iron there continues to be a good demand, and the last declared prices are at present well maintained by the principal makers. Plates, sheets, and rails are in great request, but in rods the market is very flat. The trade in pig iron also continues very dull. Buyers are represented as anxiously waiting to see the result of the recent speculations, and will not purchase more than immediately required. In all probability a large quantity will speedily be thrown upon the market. Nor is this all which tends to depreciate the value of pigs. The excessive make in Wales, Scotland, South Staffordshire, Shropshire, and Worcestershire, has created a complete glut. The make in Wales during the last twelve months is said to have amounted to about 700,000 tons; Scotland, 600,000; and South Staffordshire and Worcestershire, 600,000. These, with the make in Shropshire and other places, in the aggregate, will produce between 2,000,000 and 3,000,000 pigs during the last year; and, as such quantities cannot be worked off by the mills and forges, the result is that the price of pigs must go down a little, unless some of the furnaces (of which there appears to be no prospect) are put out of blast.

Glasgow Pig-Iron Market.—Glasgow, May 14.—Our pig-iron market, which opened very flat on Monday last, has recovered a little, and we have rather more inquiry for warrants at 50s. 6d. cash, holders asking 51s. No. 1 G.M.B. quoted 52s.; Glengarnock, 53s.; Gartsherrie, 55s.

America. — The Royal Mail Steamer *Arabia* arrived at Liverpool on Saturday with advices from New York to the 4th inst. We learn from there that Scotch pig iron was selling at from 35 to 36 dollars per ton. The United States Mail Steamship *Humboldt* arrived off Cowes on Wednesday evening, and landed the mails from New York, which contain advices from that city to the 7th inst. We learn from these that Scotch pig iron was sparingly purchased at 35 dollars the ton.

Bombay.—Letters through Marseilles recently received, describing the state of the Bombay market from the 29th of March to the 13th of April inclusive, state that English bar and square nail-rod iron have declined about 2r., but no sales at the reduced rates have been reported. Round nail-rod is scarce in the market, and wanted. Sheet and hoop have declined 1r. and 2r.; Swedish bar iron sells at 50r. and 52r., and faggots at their former rates.

The New Customs' Regulation.—Article 6 of the Amended Schedule of the Customs' Regulations relating to iron and machinery, is in these terms:—"With regard to iron and steel, wrought-iron wire and rough-iron castings will be admitted free, and machinery, wrought or polished castings, tools, cutlery, and other manufactures of iron and steel not enumerated, at 2s. 6d. the cwt., instead of 5s., as in the first schedule."

Lunar Rainbow.—On Monday evening last a very rare and beautiful phenomenon was visible in the heavens, and, during the time of its continuance, excited a considerable degree of interest. At Woodford, in Essex, it was distinctly seen from a quarter to half-past 12 A.M. It was what is termed a lunar rainbow, and the arch was as perfect as though formed by the sun. The inner portion of the arch, at 25 minutes past 12, assumed a kind of purple hue, and then the moon entering a cloud, the bow gradually became indistinct, and died away, as in the case of the solar rainbow. Numbers of persons were collected in the vicinity of Woodford and High Beach to witness this novel and interesting phenomenon.—*Times.*

Meteorological Observations.—At the Royal Observatory, Greenwich, the mean height of the barometer in the week was 29·760 in. The mean temperature of the week was 45·3°, which is 6·6° below the average of the same week in 38 years. The mean daily temperature was below the average on every

day of the week, and this depression amounted to 12°, 10°, and 9° on the first three days. The air became gradually warmer, and on Saturday the mean was 51°. The mean difference between the dew point temperature and air temperature was 7·9°; the greatest difference was 17·4° on Thursday; the least was 2·1° on the same day.

ON DRYING GOODS IN WARM ROOMS.

(From the *Scientific American*.)

ALTHOUGH water possesses a specific gravity eight hundred and fifteen times greater than that of air, yet it can rise into the air as into a vacuum, and mingle amongst it by the same law that gases diffuse through each other. It is this property of water which enables us to have clean and dry linen; for if it were otherwise—if water was the same as oil—our wet clothes would have to be converted into fuel, and burned in the fire before we could expel the moisture from them. Were it not for this property of water, the calico-printers and woollen-dyers could never dry their pieces in shade, sunshine, or stove-room. When wet goods of any kind are submitted to heat in a room, they soon become dry, because the air receives the moisture, and retains it in its soft embrace, thus enabling us to obtain dry goods and dry clothing by the property of evaporation which belongs to water, and the law of gaseous absorption which reigns among the gases. A curious property of the evaporation of water, discovered by Dr. Dalton, is, that the quantity which will rise in a confined space is the same, whether that space be a vacuum or be already filled with air; hence it is only necessary to know what quantity of vapour rises into a vacuum at any particular temperature, to know what quantity will rise into the air. Thus the vapour of water which rises into a vacuum at the temperature of 80°, depresses the mercurial column one inch; its tension is one-thirtieth of the usual tension of air. If water at 80° be admitted into dry air, it will increase the tension of that air one-thirtieth if the air is confined, or increase its bulk one-thirtieth if the air is allowed to expand. A certain fixed quantity of the vapour of water, therefore, can only rise into a certain fixed quantity of air; hence the air of rooms employed for drying goods may become so saturated with moisture, that the fuel may be expended foolishly in trying to expel the moisture from the goods when it is impossible for the air to take it up, and hence the evaporation of water is greatly facilitated by a current of air. This is the philosophic principle of evaporation embraced by Bessemer, and that mentioned under the head of Recent Foreign Inventions, in this Number of the *Scientific American*, for evaporating sugar syrups.

In evaporating by means of hot air, as in drying goods in the stove-rooms of calico print and bleaching-works, when the rooms are heated by flues running along the floors, it should not be forgotten by those who have charge of such drying establishments, that a certain time must elapse after the goods are placed in the rooms, before the air is saturated with humidity; due discretion must therefore be exercised not to let any of the hot air escape until it is saturated with moisture.

It has been proposed to us more than once, to employ hot air in raising steam, under the mistaken idea that more steam could be generated with less fuel by the passing of such a rarified hot body through the water. But in evaporating water by heated air—the way wet goods are dried—the vapour itself carries off exactly the same quantity of heat as if it were produced by boiling the water at 212°, while the air associated with it requires also to have its temperature raised, thus requiring more fuel; hence water can never be evaporated in a drying-room, with so small an expenditure of fuel, as steam can be generated in a close boiler. These facts are well worthy of attention, inasmuch as they relate to different branches of business, in which very many of our people are interested.

The New Shears in Woolwich Dockyard.—The workmen in the masthouse are preparing new shears to be put up on the wharf wall between the basin and the river, for the convenience of putting in or taking out boilers and heavy machinery from the largest steam-vessels in the service. Some idea may be formed of the size of the masts when finished, when it is stated that there will be four of them, each 104 feet in length and 40 inches in diameter. Formerly it was with the greatest difficulty trees in any degree approximating to the size required could be obtained; but now no difficulty whatever exists, as the four masts now making will be formed of pieces of timber only 10 inches square, and of moderate length, the pieces being joined together by marine glue, until the full size is attained.

TWINING'S ARTISTS' GONIOMETER.

THE instrument bearing the above name,

and which was described in a paper by its inventor, Mr. Henry Twining, read at a recent sitting of the Royal Institute of British Architects, is intended to assist in obtaining correct representations of objects from Nature, by pointing out the different angles at which they present themselves to the eye, as well as by finding out the vanishing points of their retiring sides. The instrument consists of a graduated semicircular plate placed horizontally on the top of a rod or pillar, so as to be raised or lowered at pleasure. Above this plate, or dial, is placed another having a vertical position, which is susceptible of being moved in a vertical direction round its axis, and which serves to mark the elevation and the depression of any point above or below the horizon.

By means of the goniometer the true position or distance of the ground-line of a picture is found, whether the plane intersected by it be on the same level as that on which the observer stands, or on a different level at a determinate depth below that plane. Hence, by observing the depression of the angle which the bottom of a picture attains below the line of the horizon, and comparing the interval thus measured from the horizon downwards with the height of the figures, or with the portion of the space between the ground-line and the horizon which they fill up, we find out the real distance from the observer at which they are situated, or at which the scene represented is supposed to commence. It is not until all this has been done by a process, which, like the one here indicated, is without the boundary of the picture, that the means which the usual perspective problems furnish for marking out retiring distances within the picture, can be considered to be perfectly correct.

In connection with the horizontal arc or plate is another index, consisting of three branches or wires placed at right angles, and which is susceptible of a horizontal motion. Its position is immediately above the horizontal graduated plate. The straight side of this plate is placed parallel with the picture, the angular dimensions of which are marked on the graduated arc. The cross wire of the index immediately above is then so directed, that to the observer's eye, it will correspond exactly with a given line of any object in nature of which it is wished to obtain the direction, or, in other words, the inclination with reference to the plane of the picture. A plan recommended by Varley for attaining this purpose, is to give to one of the limbs of a jointed rule the inclination which any receding line in nature may appear to have to the eye; but with this instrument we reverse the method, as it were; for we adjust the direction of a wire which is level so as to correspond with the horizontal, though apparently inclined line, of any retiring object; and then we find out, on the graduated plate connected with the wire, the exact position of the vanishing point to which not only the line just measured converges, but all those which extend in a direction which is parallel with it. Thus the true inclination of all horizontal lines is obtained by finding out, in the first place (and afterwards by transferring to the picture according to a simple method, but which cannot here be fully detailed,) the vanishing points of all level lines of objects.

The horizontal plate and index thus serve to convey clear and precise notions of the direction of the vertical surfaces of objects relatively to the plane of the canvas, whilst the vertical arc serves to give the angular elevation and depression of objects, or their extension above or below the horizon; a correct representation of nature, under various circumstances, requiring a perfect familiarity with both these principles. The advantages of this instrument, generally speaking, may be considered to consist in accustoming the student's eye, by its frequent use, to appreciate the perspective relation of objects, as it were, intuitively, and without embarrassing the mind, while sketching in the open air, with the intricacies of perspective problems and diagrams.

The author offered some remarks in further elucidation of the subject, and pointed out several instances in which the eye is deceived as to the real size of objects in nature, and false representations of them are consequently given in pictures. Thus the sun, at different degrees of elevation above the horizon, is often made too large in paintings, and the reflection of its rays on real water becomes the cause of an optical delusion arising from the perspective foreshortening. A picture, properly, should be contained within a circular outline, so disposed that the visual diameter should subtend an angle of 50°; and the distance of the spectator from the centre of the picture should be equal to that width or diameter. Such an outline, however, does not harmonise generally with the fittings and finishings of our rooms, and a rectangular shape is therefore usually adopted, of which the horizontal sides should subtend angles of 50°, and the vertical ones, angles of 40°, to insure good proportions. In a picture representing a level scene, as a sea view, the horizontal line, or level of the eye, should be situated at about one-quarter the height of the picture, equal to an angular eleva-

tion of 8° to 10°. In a mountainous scene, viewed from a considerable elevation, the horizontal line would be proportionably raised to about two-thirds the height of the picture.

The introduction of human figures gives a standard of proportion to a painting, which requires much consideration on the part of the artist. At twenty yards distance, the height of a human figure would subtend an angle of 5°, and the usual proportions of the figures in a landscape correspond to those of individuals who, in nature might be situated at about that distance; two-thirds of this space, or thereabouts, being represented by the small interval which separates the picture from the observer. Such pictures being generally of small dimensions, must be viewed from a near position, and their due effect greatly depends on the choice of that position. Hofland, in his view from Richmond-hill, has introduced the figures correctly, at some distance from the ground line, and below the eye of the observer. In such a picture, which has a very high horizontal line, the figures must be placed at least at forty feet distance; if put in the foreground, they would destroy the effect of the landscape. Claude has violated the rules of perspective proportion by the manner in which the figures are introduced in his paintings, as they are always placed below the horizontal line even in level scenes, where the eye of the observer could not be situated above them. Vernet, the marine painter, Salvator Rosa, Wilson, and some modern painters, have committed the same error, in the position of the figures with respect to the horizontal line, which Mr. Twining pointed out in some engravings taken from their works. In an engraving reduced from the original, which would be viewed more closely than that original, the error would be more apparent. The angular measurement of the real distance of figures from the observer which the instrument would afford, and which could be transferred to the drawing, would prevent the artist from committing like mistakes.

The author next explained the manner in which the vanishing point of all lines might be determined by the instrument, and transferred to the drawing-board. Artists generally assumed the vanishing points to be within the picture, but the instrument would give the exact position of them. In sketching from real objects, as houses, or streets placed in different directions, the angular measurement given by the instrument would insure greater correctness than mere linear measurement, often taken by the eye on the pencil. Though opinions on æsthetical principles may fluctuate, yet the application of mechanical means, such as the instrument under consideration, must tend to the improvement of art genrally, and not least to the correct delineation of architectural subjects.

In the discussion which ensued, Mr. Mocatta, the Chairman, said that, as architects, they all understood the value of drawing by angles; they were already acquainted with Nicholson's centrolinead and other instruments, which had led them to understand the difficulty of fixing a vanishing point out of a picture. The instrument described by Mr. Twining appeared to be more applicable to landscape drawing than to architecture. They, as architects, were accustomed to make their perspective drawings by means of planes and angles obtained by rule from geometrical elevations and ground plans; but in sketchings from nature they could not so readily apply the rules of perspective, as when they worked with plans before them. In such circumstances, inventions such as Mr. Twining's were of much value and interest. Every one knew the difficulty of representing ascending or descending planes; how satisfactory they were if rightly drawn,—how painful to the eye if wrong. With regard to the figures introduced by Claude and others in their pictures, some poetic license should be allowed; and Mr. Twining had ably illustrated the unpleasant effect which would be produced by a figure in the foreground on a level with the eye, if correctly drawn, when compared in size with distant objects.

Mr. G. Foggo considered Mr. Twining's invention, giving as it did a quadrant moveable on an universal joint, was peculiarly applicable to teaching pupils. In teaching perspective, there was always confusion and difficulty in respect to the accidental points; but with the new instrument they might be made much more simple. The student of perspective necessarily had such a mode of measurement in his mind, but it was much better to have the actual thing itself. In regard to the size and position of figures in pictures, it should be remembered that perspective, as applied to positive forms, was very precise; but whenever there were life and motion, that position was deviated from. Thus the human eye possessed a degree of brilliancy and mobility which made it appear larger than it really was, and the artist who neglected that fact would produce that unpleasing effect always seen in photography. In the same manner the artist saw the sun surrounded by a halo which made it appear larger than it would if it were actually measured by any instrument. Mr. Twining's instrument, there-

fore, should be used by teachers who would bear in mind the difference between precise objects and those having life and motion. Turner would never have acquired his great reputation if he had merely drawn by lines; the student, however, must know how to do so in the first instance, and he could afterwards cultivate the poetry of art. In the representation of figures in pictures, truth should be rigidly adhered to, but the taste of the artist was shown by the introduction of figures in situations where their size would add to the effect. If the landscape were the principal feature, the figures should not be so large as to be out of proportion with it; but if it was intended to be a mere background to figures, then the latter should have their full proportions.

Mr. Twining, in respect to the size, &c., of figures adverted to the different aspect assumed by objects at different levels. This was of great importance in the representation of arches, of the squares of a pavement, &c.; and the necessity of angular measurement to insure accuracy in these points must be generally acknowledged. In answer to a question from Mr. Roberts, in what respect the new instrument was superior to the camera lucida for sketching scenery, he having, in his own practice, found great advantage from the use of this instrument, he said, that although, in one respect, the camera lucida had infinite advantages over his instrument, it must be remembered that the former taught nothing. A child might follow the outline given by the camera lucida without learning anything; but after a person had exercised his eye and his judgment for a week or two with the new instrument, he would know a great deal of perspective. In reply to the chairman, Mr. Twining added, that he only took in 50° or 60° with the instrument for a picture, though it might take in 160°.

Mr. J. W. Papworth adverted to the known fault of the camera obscura and the camera lucida of distorting upright lines. Any instrument which gave a mechanical check to the unsteadiness of the eye in drawing would necessarily be a great boon; but it appeared to him that the eye was required to be perfectly steady in using Mr. Twining's circular plate. Instruments were generally used under the pretence of saving time, but in reality to save study. He should, indeed, by no means recommend the use of instruments at all. Any gentleman who had practised photography would know that no greater number of sketches could be so produced than by the eye and hand. He believed the discovery was beginning to be made that the eye and the hand were the best machines for drawing.

Mr. Twining explained that the needle might be lowered, so as to touch the quadrant, rendering the observation of the angle indicated by the former a matter of absolute certainty. There was, however, a little difficulty in transferring the angle so obtained to the picture, because the least difference in the distance of either centre from the picture would make a great difference in the result.

Mr. Scoles observed, that in his own practice with the camera lucida, he had found it an easy matter to prevent the divergence of lines referred to by Mr. Papworth, by having the drawing-board fixed (by the aid of a spirit-level) in a perfectly horizontal position; with this precaution, he had found the camera lucida of the greatest use in getting the main outlines, or even a geometrical elevation of a building. As Mr. Twining had observed, artists frequently made their angles too great in representing mountains. On one occasion, he was in company with several gentlemen accustomed to draw by the eye with every appearance of accuracy, and each of them made drawings of Mount Etna; but when the angle of the mountain, as taken by a pocket sextant, was compared with their drawings, it was found they had all made it about twice as much as it ought to be. There certainly was a difference in the angle presented to the eye, and that obtained by an instrument; and it might be a question whether the latter or the former should be adopted by the artist.

Mr. Tarring described an instrument, on the principle of the carpenter's bevel, invented and applied by Brown, the author of "Brown's Perspective," for measuring the angles of horizontal lines.

Mr. Mocatta referred to a simple means of sketching by the aid of a frame with cross lines, made to correspond with similar lines on the sketching-paper.

The thanks of the Institute were voted to Mr. Twining for his valuable communication.

MORRIS AND JOHNSON'S PATENT METAL DEPOSITING PROCESS.

Some very beautiful specimens of steel chains, coated with various metals under a new process, for which letters patent have recently been obtained by Messrs. Morris and Johnson, of Birmingham, have been brought to our notice during the past week, and are remarkable for the uniformity of the precipitation, in point of thickness and colour, the successful management of the

tinting, and the height of polish which has been communicated to the surfaces. The specimens sent us include examples of the deposition of silver and brass,—the colour of the latter having several different degrees of depth.

Messrs. Morris and Johnson's patent embraces the deposition of alloys of gold and silver, German silver, brass and zinc, all of which can be deposited with ease, certainty, and dispatch upon any metals whatever; and particularly upon iron. Adopting the means invented by the patentee, we understand that they can deposit metallic alloys on surfaces composed of malleable-iron, wrought-iron, cast-iron (which is found to require great battery powers), steel, soft iron, tin, zinc, lead, copper, and all the inferior metals. This process also enables the thickness of the deposit to be adjusted to the greatest nicety according to the intention of the operator.

There are some points incidental to this patent of a new and very important character. It is well known that hitherto silver has not been successfully deposited upon steel, without having recourse to an intermediate coating of copper. The advantage to the practical operator of being able to dispense with this intervening step, which greatly enhances the cost of the process, and the time consumed in accomplishing it, will be readily appreciated. In several other metallic combinations the same observation will apply in a greater or less degree, and it may be considered, for this reason alone, that Messrs. Morris and Johnson's patent will become extensively available in a great number of important manufactures. Hitherto, in certain of these, the difficulty experienced in depositing upon iron and steel has been the want of adhesion, but by this invention perfect adhesion is secured, together with any thickness of coating. The beauty of the brass deposit in the examples before us is indeed remarkable, and, aided by the fineness and high polish of the surface, presents a close resemblance to gold, of which, we presume, it is intended to be an imitation. The deposit upon them, we are informed, is extremely thin; but having been polished previous to immersion in the bath containing the deposit, they are taken out with a surface as brilliant as that which they possessed when they were immersed. The invention is highly spoken of, and is likely to become one of great practical value, and prove to be an advance in the application of electricity to manufacturing purposes.

ON THE MANUFACTURE, BY IGNITION, OF ARTIFICIAL BLOCKS FOR HYDRAULIC CONSTRUCTION.

M. Berard, in the *Comptes Rendus*, No. 12, March 21, describes an important and valuable process for manufacturing, simply by means of ignition, blocks to be employed in hydraulic works, and particularly submarine ones. The method which he has invented has certainly the advantage of being extremely simple, while in very many situations it would admit of being conveniently carried out in practice, and chemical considerations appear to promise for it, in any case in which it might be adopted, all the success which the engineer can desire. We take the following account of the subject from the May Number of the *Chemist*,—a serial of considerable merit to which the scientific public of this country are indebted for the knowledge of many of the works of continental experimentalists:

To appreciate the value of the process of which we are about to give a succinct description, it is in the first place necessary to understand fully the conditions which have to be fulfilled; they may be briefly stated as follows:—1st. To be able to construct either at, or near the point requiring strengthening blocks of such a density and size, that the resistance offered by their inert weight should be superior to the pressure and displacing power of the waves. We may mention, as the minimum to be attained, a volume of 15 cubic metres with a density of 2·1 to 2·2, which would be reduced to about 2·0 to 2·1 after immersion in salt water; 2nd. That these blocks should have sufficient solidity to support the carriage and immersion with fracture, and so much hardness that the mechanical action of the friction of the waves should be without effect on their surfaces; 3rd. That their chemical composition should be of such a nature, that both alkaline waters or even acids should be without influence enough to cause the decomposition or disaggregation of the constituent elements; 4th. Finally, that the materials composing these blocks should be common substances and such as can be found almost everywhere, and consequently, of sufficiently low price to render their employment economical and always accessible in all works.

Hitherto, as we have seen, all artificial blocks have had as a base or agent of agglomeration lime, more or less hydraulic. In the new process, we place ourselves in a diametrically opposite position, we have endeavoured to prove whether the means of

fire will not be preferable. Hydraulic lime is a silicate of lime in somewhat of a nascent state; that is to say, that the chemical combination is not entirely effected. If a more powerful agent than silica, acting as an acid, should come and destroy this commencement of combination, the lime become free may pass to the state of simple hydrate or chloride of calcium, and become dissolved. This is the effect which appears to be produced in the present hydraulic blocks. But if, instead of incompletely formed silicate of lime we use a perfectly determined silicate, and if, moreover, for the lime, a soluble base, we substitute alumina, an insoluble base, it is evident that a body would be obtained quite unattackable by sea-water.

It is on these principles that the author has thought that by employing the commonest argil, which is a silicate with a base of alumina, with variable but small proportions of iron, a little lime, and sometimes magnesia, and by subjecting this argil to the commencement of vitrification which determines the complete combination of these various elements, a body may be obtained which would be perfectly unattackable by all possible waters, and possessing the before-mentioned required conditions. Experiments made in accordance with this idea have completely justified these expectations. The means of execution used are most simple. A block, of any required dimensions, is constructed of bricks which have not been baked, but merely dried in the sun. These bricks, taken from the field, are stratified in layers with the combustible on some piles of field bricks, which serve as a grating, and which are sufficiently far apart. An outer case, likewise constructed of bricks, and at the distance of some centimetres from the block, envelopes it entirely; the space left between the case and the block is filled with powdered charcoal; a small quantity of this same combustible may be placed between the layers of the bricks in the case, if they are unbaked bricks, which will serve to bake them. The fire is placed at the base of the block; it soon mounts up, heats the interior mass which forms the block, which it carries to the temperature which will soften argil nearly to fusion. The contraction produced by the baking of the bricks and the combustion of the intercalated charcoal, causes sinkings and vacancies, which must be filled up as fast as they are produced. The case and the block are thus raised to the height required by the latter; then the whole is covered with a final layer of charcoal and several thicknesses of bricks, all the openings are closed, and the whole is suffered to cool. For the removal of the block it is sufficient to pull down the outer case which will provide baked bricks; the block thus exposed may be transported to its destination.

Instead of a case made of ordinary bricks, which requires to be built up every time, a case may be used formed of refractory bricks kept in their places by iron or brass, forming a collection of panes. The charcoal placed between the layers of bricks may then be replaced by gratings placed round the whole extent of the case. A moveable dome covers the whole. As to the nature of the combustible used to develop the amount of heat necessary to produce the nascent vitrification or softening of the mass, so as to obtain the agglomeration of all its parts, ordinary coal may be used, or poor anthracitous coal, or even the refuse of coke. In all our ports combustibles are easily obtainable, whether indigenous or English coal, at moderate prices. The quantity required for baking a block varies according to the nature of the argil and the mixtures of sand which it may sometimes be judged right to introduce into it; it is not much greater than that required for the simple baking of bricks. It will be seen the method of executing these blocks is susceptible of numerous modifications. The essential and entirely new principle is the employment of heat as an agent of agglomeration of isolated fragments of vitrifiable matters; this is a new plan, which may prove very fertile in useful results.

From the above it results that blocks may be made of any shape, of a very considerable size, which would have no limit but the possibility of carriage, and which, consequently, might far exceed the limit above mentioned, of 15 cubic metres. The density of these blocks is superior to that of lime blocks; it is variable, according to the nature of the argil used. The ferruginous argils would give blocks of a density of from 2·4 to 2·5, corresponding, after immersion, to from 1·3 to 1·4,—that is to say, more than a fourth superior, in respect of resistance, to the ordinary blocks. Extension of processes indicated would enable us to construct, out of the water, entire dikes, or jetties, without solution of continuity, and of which the mass would be immovable as well as indestructible.

When the operation is properly conducted, the solidity of the product and its resistance to fracture would leave nothing to be desired; immense trouble is required to break blocks thus constructed. As for its durability, iron instruments are unable even to scratch the surface; steel would scarcely do it; whence we are led to think that the destructive action of the friction of the waves will be imperceptible. A simple ex-

amination of these burnt blocks will suffice to prove their complete unalterability in any sea water; it is a vitrification on which the most concentrated nitric and sulphuric acids, and the most powerful alkaline solutions, take so little effect as scarcely to alter the asperities on its surface. It is scarcely necessary to say more on this subject, which is the most important part of the question, so evident is the fact.

Finally; the matter used for these blocks being common argil, which is one of the most widely-spread bodies in Nature, the constituent element for their formation will almost everywhere be found at hand. From this it follows that the price would always be below that of lime blocks. To the qualities of durability and indestructibility is added that of economy. These blocks thus formed answering all the desired conditions, appear to us to offer a complete solution of the difficulty hitherto found. We may henceforth give ourselves up in security to the important maritime works required for the development of our naval power. France will moreover have the honour of conferring on the world a fresh benefit in an invention so eminently useful to mankind in the numerous consequences arising from it; that is a species of glory by no means the least dear to her children.

LOCOMOTIVE-ENGINE FURNACES.

Zerah Colburn, an engineer of great repute in America, has contributed the following observations on locomotive furnaces to the *American Railway Times;* and they are worthy of attention, as confirming the views expressed in Mr. D. K. Clark's paper read before the Engineers, which appears to have attracted much attention in the engineering community of New York:

The dimensions of locomotive furnaces are to be fixed from their required evaporative power, although a majority of engines are of such arrangement, for adaptation to a narrow gauge of tract, that the furnace does not have the sizes which are due to its task. The proportions of the arrangements known as the furnace are its cubical contents, its inner surface, and particularly the surface of the crown, or top sheet, the opening for the entrance of air, and the opening for the escape of the heated gases.

In the fire-boxes of the engines built by Hinkley in the years 1847, 1848, and 1849, a majority had 33 cubic feet of content; 50 square feet of inner surface in contact with water, of which 8·3 were crown surface; 8·3 square feet of grate, of which 2·4 were air-openings (being 29 per cent. only of the whole surface). The opening of tubes inside of thimbles being 125, and of 1 3·8 diameter, is 1·63 square feet. The engines furnished with these fire-boxes would evaporate about 180 cubic feet of water per hour, when doing good work. For the amount of evaporation, these engines have quite small furnace proportions when compared with recent engines from the same and other builders, and yet these furnaces would make steam very fast. To furnish the draught for these furnaces 2,500 cubic feet of steam, at the working pressure, were discharged in each mile run, through two round openings of 1 7-8 inch diameter each. The relative efficacy of furnace surface is often stated, on the strength of experiments made by Stephenson, as being three to one of tube surface. And, from experiments made by Armstrong, the crown of a furnace has twice the generative power of its sides with equal extent of surface. It cannot seem entirely the best plan to adopt depth for length of fire-box, and yet many do not learn to make any distinction. Hinkley has furnaces on the Erie road of a depth of 5 feet 4 inches, from crown to grate. The water spaces are seldom made any too wide. Many Boston-built engines have wide grates, obtained by a reduction of the water spaces to 1 1-2 inches. Three inches would be better, and the inner sheets should have an inclination inwards, so as to give a better chance for the steam to rise through the space.

Where the door is placed very near the top of the furnace, there is always a great deal of cold air rushing through the tubes when firing. The door is usually carried as high as it can be for convenience in firing; but if dropped some inches, its opening will not affect the pressure of the steam as readily as otherwise. It is a practice not always observed, of fitting a grate closely to the sides of a furnace, and of closing up the front ends. There is a saving of fuel in this which rewards the pains taken to do it. It should be a point to take the air directly through the fire, instead of allowing it to enter upon and ascend the walls of the furnace.

It is known that thin iron has less chance for becoming blistered than thick iron.—Many furnaces made of 3-8 inch iron, become badly blistered after a short wear, and 1-4 inch iron stands extremely well in the New York and Erie engines. With increased durability it has the advantage also in having less weight. Crown sheets of this thickness need extra staying to support their load. If the stay-bars rest upon the sheet near its edge, the sheet may, if thin,

collapse downwards. This was the form of explosion which disabled the engine "100" upon the Erie road. This engine had a crown-sheet of 16 square feet, carrying a load under the maximum pressure of 150 lbs. per inch, of 172 tons! The stay-bars should rest at their ends upon the upper edges of the side-sheets.

Copper, from its extra soundness and durability, and extra conducting power (2 1-2 times that of iron) is sometimes preferred for furnaces. A copper furnace is, however, an expensive article, and should be used with pure water, which should be often blown out. The boilers provided with it should have ample steam room, and a good depth of water on the crown sheet. By observation among a large number of engines it is undeniable that those having copper-tube sheets show the tightest tubes. Every engine on the Boston and Providence road has a copper-tube sheet, and six engines have entire furnaces of copper. All these engines receive their feed water at a distance of 6 or 7 feet from the tube sheet. It is customary to blow off the boilers twice a week, and leaky tubes are almost unknown on the road.

The Royal Albert Bridge at Saltash.—The preparatory arrangements for the commencement of this magnificent structure are being made, and we understand a very large number of men will, as soon as the workshops are completed, and the necessary machinery erected, be set to work. The site was visited by Charles J. Mare, Esq., the enterprising contractor, on Friday last, where he was met by the chief engineer, Mr. Campbell, and other gentlemen connected with works. The masonry has been entrusted to Mr. Willcocks, who built the stupendous viaduct at Ivy Bridge, and other points on the South Devon Railway. It is also currently reported, that Mr. Meredith, the representative of the late Mr. Treffry, of Fowey, has taken the contract for the supply of the granite for the bridge. —*Plymouth Mail.*

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MAY 19, 1853.

John Crowther, of Huddersfield, York. *For a self-acting hydraulic crane or engine for lifting weights, such weights when lifted to be used as motive power; as also for loading and unloading vessels and vehicles.* Patent dated November 2, 1852.

The patentee describes at great length, but rather obscurely, owing to the absence of illustrative drawings, an arrangement of mechanical contrivances in which the pressure of a head of water from a tank or reservoir is to be employed as a lifting agent to raise a float, the motion of which is to displace other water, and this in falling is to work an overshot water-wheel, the motion derived from which can be applied to the loading and unloading of vessels and other hoisting and lowering purposes. The admission and egress of water is controlled by the action of the float or lifter, and the parts are so arranged as to make the operation of the engine continuous.

Patrick McAnaspie, of Liverpool, gentleman. *For a new manufacture of Portland stone, cement, and other compositions for general building purposes, and hydraulic works.* Patent dated November 2, 1852.

The patentee describes and claims—

1. Several new combinations of substances containing lime, with chemical and other ingredients (such as copperas, common salt, clays of various kinds, soaper's waste, bone-ashes, &c.), for the purpose of producing artificial stones and cements for building purposes generally, and hydraulic works.

2. A mode of calcining the mixed materials in kilns constructed so as to exclude as much as possible the access of atmospheric air, and thus ensure an equal action of the heat in all parts thereof.

3. The application of blasts of hot air against the heaps of material in the kilns for the purpose of aiding the calcining thereof.

Joseph Walker, of Dover, Kent, merchant. *For improvements in treating cotton seeds, in obtaining products therefrom, and in the processes and machinery employed therein, parts of which improvements are applicable to distillation.* (Partly a communication.) Patent dated November 2, 1852.

The patentee claims with relation to the improvements described under this patent.

1.—The treating cotton seed, and obtaining valuable products therefrom. And,

2. Certain arrangements and combinations of apparatus for distilling products of cotton-seed, and other matters.

Andrew Fulton of Glasgow, Lanark, North Britain, hatter. *For improvements in hats, and other coverings for the head.* Patent dated Novembet 11, 1852.

The improvements claimed under this patent consist in adapting to hats, helmets, and other coverings for the head, a flexible padded lining, which adapts itself readily to the exact contour of the head of the wearer, and thus secures a good fit, while it also insures all the ease and comfort de-

rivable from the wearing of an easy cap. The lining is held to the sides of the hat by springs, and does not come so close to the interior but that space is left at certain parts for the admission of air for ventilation.

CHARLES LIDDELL, of Abingdon-street, Westminster, Esq. *For improvements in electric telegraphs.* (A communication.) Patent dated November 11, 1852.

Claim.—A peculiar construction of insulator for electric telegraph suspended wires.

Specifications Due, but not Enrolled.

LOUIS ARNIER, of Rue du Loisin, Marseilles, engineer. *For certain improvements in steam boilers.* Patent dated November 6, 1852.

PIERRE ARMAND LECOMTE DE FONTAINEMOREAU, of South-street, Finsbury. *For certain improvements in the manufacture of certain articles of dress.* (A communication.) Patent dated November 6, 1852.

PROVISIONAL PROTECTIONS.

Dated April 28, 1853.

1031. James Berry, of Horwich, Bolton, and Thomas Booth, of Chorley, Lancaster, machine-printers. Improvements in machinery or apparatus for printing or staining woven fabrics and paper.

1033. William Hurt Sitwell, of Sydenham, Kent, Esq. Improvements in projectiles for cannon and fire-arms.

1035. William Armand Gilbee, of South-street, Finsbury. Improvements in apparatus for heating. A communication.

Dated April 29, 1853.

1037. George Thomas Day, of Burghfield-hill, Berkshire, gentleman. Improvements in travelling packages.

1038. Thomas Pennell, of Birmingham, gun-maker. Improvements in the construction of revolving or repeating fire-arms, and in loading the same.

1039. Charles Auguste Joubert, of Paris, merchant, Léon Jacques Tricas, of Paris, merchant, and Jules César Kohler, of Paris, engineer. Improved busks for stays.

1040. Robert Davison, of Mark-lane, London, civil engineer, and James Scott Horrocks, of Heaton Norris, Lancaster, gentleman. Certain improvements in the means of conveying and distributing, or separating, granular and other substances.

1041. Thomas Collins Banfield, of Queen's-square, Westminster, Esq. Machinery for cutting or chopping roots, planks, or other similar substances. A communication.

1042. Thomas Collins Banfield, of Queen's-square, Westminster, Esq. Drying and preserving vegetable or other saccharine plants. A communication.

1043. Jacques Stanislas Vigoureux, of Rheims, France. Certain improvements in the combing of wool and other fibrous materials.

1044. James Macpherson, of Manchester, machine-maker. Certain improvements in looms for weaving.

1045. Colin Mather, of Salford Ironworks, Salford. Improvements in apparatus used in bleaching.

1046. Henry Witthaff, of Sidney-street, Oxford-road, Manchester. Improvements in filters. A communication.

1047. Oliver P. Drake, of Massachusetts, United States. A new or improved apparatus for vaporising benzole, or other suitable volatile hydro-carbon, and mixing it with atmospheric air, so that the mixture may be burnt for the purposes of illumination or otherwise.

1048. John Kealy, of Oxford-street, Middlesex, agricultural-implement maker. Improvements in machinery for mowing.

1049. James Bristow, of Bouverie-street, London, miller, and Henry Attwood, of Holland-street, Blackfriars-road, Surrey, engineer. Improvements in the means of consuming smoke.

Dated April 30, 1853.

1050. Charles Adams, of Lillington-street, Westminster, plumber and glazier. A new arrangement of valves, for the supply of water to and from cisterns and other receptacles, and for a new float valve.

1051. Barnabas Barrett, of Ipswich, sculptor. Improvements in the treatment of natural and artificial stone, and of articles composed of porous cements or plaster, for the purpose of hardening and colouring the same.

1052. John Smith, of Ashton, Warwick, engineer. An improvement in machines for cutting chaff, straw, gorse, and other similar substances.

1053. Weston Grimshaw, of Moseley, Antrim, Ireland, flax-spinner. Certain improvements in slubbing and roving-frames for preparing for spinning cotton, flax, and other fibrous substances.

Dated May 2, 1853.

1054. John Balmforth, William Balmforth, and Thomas Balmforth, of Clayton, Lancaster, iron-masters. Improvements in steam hammers.

1055. John Smith, of Aston, Warwick, engineer. An improved flooring-cramp and lifting-jack.

1057. Henry Constantine Jennings, of Great Tower-street, London. Improvements in the manufacture of soap.

1058. John Filmore Kingston, of Carrol, Maryland, United States, engineer. Improvements in reaping and mowing-machinery.

1059. Edwin Heywood, of Glusburn, Keighley, York. Improvements in apparatus for actuating and regulating the throttle valves of steam engines.

1060. James Reeves, of Bridgwater-gardens, Barbican, London, gold and silver turner. Improved machinery for forging, stamping, crushing, or otherwise treating metals, ores, and other similar materials.

1061. George Murton, of Eagley Mills, Bolton, Lancaster, manufacturer, and William Hatton Langshawe, of the same place, manager. Certain improvements in stretching, dressing, and finishing cotton and linen yarns or threads, and in the machinery or apparatus connected therewith.

1062. Auguste Edouard Loradoux Bellford, of Holborn, Middlesex. Improvements in the extraction and manufacture of sugar and of saccharine matters. A communication.

1063. Daniel Reading, of Chambers-street, Minories, block-maker. Improvements in bearings for axles, and in axle-boxes and bushes.

1064. François Monfrant, of Paris, coal-merchant. Improvements in lubricating materials. A communication.

1065. Auguste Edouard Loradoux Bellford, of Holborn. Improvements in sawing-machines for slitting or resawing plank and other timber by means of circular saws. A communication.

1066. Ambroise Maurice Christophe Claude Faure, of La Plaine, France. Certain improvements in the manufacture of geographic and other maps.

1067. Christian Radunsky, of Cockspur-street,

Middlesex. Certain improvements in electro-voltaic apparatus. A communication.

1068. Mark Newton, of Tottenham, Middlesex, builder. Certain improvements in the construction of carriages, and in the means of preventing the overturning of the same when horses take fright. A communication.

1069. Joseph Thomas Wood, of Holywell-street, Strand, Middlesex. Improvements in the manufacture of boxes, such as have been hitherto made of pasteboard.

1070. Honore Mane, of Arundel-street, Strand, Middlesex. Improvements in steam engines.

Dated May 3, 1853.

1071. Thomas Claridge, of Bilston, Stafford, engineer. New or improved machinery for cutting or shearing metals.

1072. George Thomas Holmes, of the firm of Holmes and Sons, of Norwich, Norfolk, engineers and agricultural-implement makers. Improvements in thrashing-machines and apparatus connected therewith for shaking the straw, riddling, winnowing, and dressing the corn.

1073. Robert Walter Swinburne, of South Shields, Durham, glass manufacturer. Improvements in the manufacture of glass.

1074. George Frederic Goble, of Fish-street-hill, London, civil engineer. Improvements in locks.

1075. Richard Quin, of Rodney-street, Pentonville, Middlesex. Improvements in the manufacture of cases for jewellery, for optical and other instruments, miniatures, and other articles.

1076. Severin Virgile Bonneterre, gentleman, of Paris. Certain improvements in machinery for manufacturing screws.

1077. Edward Thomas Bainbridge, of Saint Paul's Churchyard, London. Improvements in obtaining motive power.

1078. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. Improvements in treating certain ores and minerals for the purpose of obtaining products therefrom.

1079. Thomas Chambers and John Chambers, of Thorncliffe Ironworks, Sheffield. Certain improvements in kitchen sinks.

1080. Frederick Arnold, of Park-road, Barnsbury. Certain improvements in binding or covering books.

1081. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in hot-air furnaces for heating buildings, some of which improvements are applicable to other furnaces. A communication.

1082. Frederic Lipscombe, of the Strand, Middlesex, water-filter manufacturer. Improvements in propelling vessels.

1083. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery or apparatus for dressing mill-stones. A communication.

Dated May 4, 1853.

1084. George Bell, of Inchmichael, Perth, farmer. A new machine for several agricultural purposes.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 13th, 1853.*)

969. André Jacques Amand Gautier. An improved treatment of peat.

1037. Joseph Hamblet and William Dean. An improvement in the manufacture of bricks.

1059. Joseph Paul Marc Floret. An improved method of producing simultaneously gas-light and lime or plaster.

1080. Thomas Mortley. Improvements in constructing the tablets, letters, and figures for indicating the names, designations, or numbers of streets, houses, buildings, and other places.

(*From the "London Gazette," May 17th, 1853.*)

1077. Richard Blades. Certain improvements in the method of cleansing sewers and drains, and in the machinery or apparatus connected therewith.

1081. Auguste Edouard Loradoux Bellford. A new system of stoppering bottles and other vessels. A communication.

1117. Robert Powell. Improvements in coats and outer garments.

1133. John Henry Johnson. Improvements in machinery or apparatus for forging iron and other metals. A communication.

1137. Frederick Ayckbourn. Improvements in rendering certain materials impervious by air or water.

1166. Pierre Charles Nesmond. Improvements in machinery applicable to the manufacture of ice, and to refrigerative purposes generally.

1197. Auguste Edouard Loradoux Bellford. Certain improvements in machinery for grinding and reducing gold quartz to an impalpable powder, and amalgamating the said ground quartz with quicksilver, the same being applicable also to the pulverizing and washing of ores. A communication.

23. Gustave Paul de l'Huynes. Certain improvements in medical portative electro-galvanic apparatus.

84. George Augustus Huddart. Improvements applicable to steam generators.

114. Auguste Edouard Loradoux Bellford. Improvements in the manufacture of batting or wadding. A communication.

252. Edwin Pugh. Improvements in the means of ballasting ships or vessels, and in rendering them buoyant under certain circumstances.

283. Auguste Edouard Loradoux Bellford. Improvements in furnaces and apparatus combined therewith, for making wrought iron directly from the ore, and for collecting and condensing the oxides or other substances evaporated in the process of deoxidizing iron or other ores. A communication.

455. John Smith. Improvements in machinery for raising and forcing water and other fluids.

609. Edward Taylor Bellhouse. Improvements in iron structures.

673. Auguste Edouard Loradoux Bellford. Improvements in power looms. A communication.

715. Robert Grundy and James Jones. Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

820. John Thomas. Improvements in apparatus for the manufacture of gas and coke.

903. William Laycock. Improvements in the manufacture of metallic and other casks and vessels.

966. William H. Johnson. Sewing cloth, leather, and other materials.

967. William Edward Newton. Improvements in machinery for bending wood or other materials. A communication.

969. James Davis. Improvements in the manufacture of thrashing-machines.

973. William Beard. Improvements in needles, and in the manufacture of the same.

1003. Uriah Scott. Improvements in the manufacture of tubular rods and rings for furniture.

1016. George Turner and Robert Holloway. Improvements in the manufacture of unfermented bread, which improvements are also applicable to other purposes as a substitute for yeast.

1030. Edward Bird. An improvement or im-

provements in the construction of certain kinds of vehicles.

1036. Thomas Revis. Improved single-seed drilling or dibbling machinery.

1040. Robert Davison and James Scott Horrocks. Certain improvements in the means of conveying and distributing, or separating, granular and other substances.

1041. Thomas Collins Banfield. Machinery for cutting or chopping roots, plants, or other similar substances. A communication.

1042. Thomas Collins Banfield. Drying and preserving vegetable or other saccharine plants. A communication.

1058. John Filmore Kingston. Improvements in reaping and mowing-machinery.

1059. Edwin Heywood. Improvements in apparatus for actuating and regulating the throttle-valves of steam engines.

1061. George Murton and William Hatton Langshaw. Certain improvements in stretching, dressing, and finishing cotton and linen yarns or threads, and in the machinery or apparatus connected therewith.

1067. Christian Radunsky. Certain improvements in electro-voltaic apparatus. A communication.

1078. Louis Cornides. Improvements in treating certain ores and minerals, for the purpose of obtaining products therefrom.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1111. William Buckwell, of Ardmore Lodge, Wellington-road, St. John's Wood. Improvements in the construction of buildings. May 5.

1102. Charles Larband, of Rue du Temple, Paris. A new system of trigger applied to play-arms, such as pistols, fusils, cannons, guns. May 5.

WEEKLY LIST OF PATENTS.

Sealed May 12, 1853.

1852:
727. John Henry Johnson.
735. Robert Lucas.

Sealed May 13, 1853.

1852:
748. Constant Jouffroy Dumèry.
750. John Mirand.
778. Henry Russell.

Sealed May 16, 1853.

1852:
769. François Vallée.

Sealed May 17, 1853.

1852:
781. James Hume.
841. Peter Armand Lecomte de Fontainemoreau.
846. Joseph Henry Combres.
848. Charles Finlayson.
855. Robert Mortimer Glover.
858. John Tatham and David Cheetham.
869. Adam Ogden and John Ogden.
870. James Ward Hoby and John Kinniburgh.
887. Thomas Wood.
942. Peter Walker and Andrew Barclay Walker.
961. Joseph Cliff.
988. Samuel Aspinwall Goddard.
998. Peter Armand Lecomte de Fontainemoreau.
1072. Peter Armand Lecomte de Fontainemoreau.
1111. William Wilkinson.

1853:
1. William Wilkinson.
60. Richard Walker.
330. William Romaine.
404. Joseph Skertchley.
412. William Bridges Adams.
510. William Edward Newton.
568. Godfrey Simon and Thomas Humphreys.
630. Robert Christopher Whitty.
643. Thornton John Herapath.
654. Samuel Colt.
655. John Oliver.
659. William Blinkhorn.
660. George Johnson.
666. William King Westly.
677. George Ross.
685. Samuel Radcliffe and Knight William Whitehead.
686. Alfred Vincent Newton.
690. Moses Poole.
691. Jean Marie Durnerin.
692. Moses Poole.
693. Isaac Taylor.
701. William Johnson.
703. Frederick Futvoye.
704. William Prior Sharp.
736. Augustin Chrysostome Bernard and Jacques Marie Pierre Albéric de St. Roman.
739. Samuel Fox.
762. James Bowron.
764. Robert Dalglish.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

C. G. W., Sheffield, inquires how iron may be precipitated by the galvanic battery? The operation of precipitating iron is one of considerable

difficulty; and as it is only desirable in very few cases, and probably not essential in any, it has not, so far as we know, been done. Iron does not occur in a native, or absolutely pure condition, but mineralised with other substances. The nearest approach to native iron with which we are acquainted, is to be found in the aërolites, or meteoric stones; and even in these there is a large proportion of nickel. As, therefore, nature does not precipitate pure iron in her own chemical operations, we may infer that some extremely artificial combination would be necessary for the purpose. The great practical object for which the deposition of iron is useful, is the protection of the metal upon which it would be deposited from the action of mercury; and there can be but few cases in which that difficulty cannot be overcome by more obvious means. In another part of this Number will be found an account of a new process for the deposition of metals upon iron and other metallic substances, for which a patent has been obtained by Messrs. Morris and Johnson. Whether that patent provides a method for the inverse process of depositing iron upon other metals, we cannot say, as the specification has not been enrolled. Our correspondent may probably be aware that the treatment of iron occurring in any manner in a galvanic series is a matter of great difficulty, requiring great battery power; and though it may not be absolutely impracticable, it would always be better to have recourse to other methods for effecting the object in view. At present, we are unacquainted with any arrangement of the kind.

A *Constant Reader* asks for information on the most improved process of cleaning, polishing, and rendering rice fit for the market, and whether the process is protected by patent? Until recently, no great improvement had been effected in this branch of manufacture. Several patents had been taken out for cleansing rice, of which that of Melvil Wilson, dated in 1826, was very commonly employed. The apparatus described in this patent consisted for the most part of a cylinder, usually laid with its axis in a slightly-inclined position, having a great number of teeth—about 80—placed radially upon its inner surface, and a shaft, which was provided with similar teeth. The rapid revolution of the shaft carried the teeth of the axle across the intervals of those fixed upon the concave surface of the cylinder, with the intention of parting the grains, and of detaching the husks or other impurities which might attach to them. The rice was fed to the cleansing cylinder by means of a hopper placed above it, and the shaft was set in rapid motion, while the cylinder received a slow motion in the contrary direction. By this action the rice was found to be cleansed, and in that state was discharged at the lower end of the cylinder, where it fell into a shute which conducted it to the ground. This method, or others substantially analogous to it, was long in use. The most recent patent on the subject, as we believe, is that of Joseph Martin, of Liverpool, dated 16th November, 1850, "for improvements in machinery and apparatus for cleansing and otherwise treating rice, and certain other grains, seeds, and farinaceous substances." The apparatus described in the specification of this patent for cleansing rice, and which is also applicable for shelling peas, &c., is constructed on the principle of the ordinary grain mill; the rice being operated upon by a runner, serrated stone, or plate of metal, revolving immediately below a fixed disc of wood, faced with cork.

R. N. B., Birmingham, states that he has one or two inventions which he is desirous of exhibiting at the Dublin Exhibition, and he wants to know how he is to proceed in order to procure for them a provisional protection. For his information, and for the guidance of other inventors who may be similarly circumstanced, we may state that the practice for this purpose is described in the 3rd and 4th sections of the Protection of Inventions Act, 1853. Under the provisions of those sections, the Attorney-general, or such other person or persons as the Attorney-general may from time to time appoint to issue certificates under the Act, must be furnished with a description, in writing, signed by, or on behalf of, the person claiming to be "the true and first inventor within this realm" of the new invention intended to be exhibited. The Attorney-general, or the person or persons so appointed, upon being satisfied that the invention is fit to be exhibited, and that the description in writing furnished to him describes "the nature of the invention, and in what manner it is to be performed," will then give a certificate in writing, under his hand, for the provisional registration of the invention. This certificate is to be delivered to the Registrar of Designs, acting under the Designs Act, 1850, who upon receiving it, and being furnished with the name and place of address of the person by whom, or on whose behalf, the registration is desired, registers the certificate, name, and place of address, "and the invention to which any certificate so registered relates, shall be deemed to be provisionally registered, and the registration thereof shall continue in force for the term of one year from the time of the same being so registered."

The Rev. J. W. Neat, Beckington, requires information as to the best way of covering the wooden model of a vessel with layers of paper, so as, upon removing the model, a perfect shape can be obtained, strong and waterproof. To answer this inquiry, we cannot do better than refer our correspondent to the following brief account of the modelling part of the *papier maché* manufacture, as popularly described in Part IV. of the "Curiosities of Industry and the Applied Sciences." The principle of proceeding will be

nearly the same, and the process here detailed will suggest the manner in which the operation may be conducted.—"In the first place we see that the paper employed has a grayish colour, and looks like thick blotting-paper; and in the next we see that a mould or form is employed to give shape to the tray. Artists or designers are constantly at work producing new patterns; but we are here supposing that a tolerably simple tray is to be manufactured. A model of the tray is prepared, giving the exact form and shape; and from this model a mould is cast in iron, brass, or copper, the surface of the mould corresponding, of course, with the interior of the tray to be made. Women and girls, seated at tables, cut up the rough gray paper into pieces of the requisite size, and these pieces are handed to the pasters, who are also women—for it is worthy of remark that this very pretty art is one which is capable of being conducted in many of its branches by females. These pasters have beside them a plentiful supply of paste, made of flour and glue dissolved and boiled in water. The mould is greased to prevent the paper from adhering. The first sheet is pasted on both sides, and handed to another woman, who lays it on the mould, pressing and rubbing and adjusting it until it conforms to the shape. Another and another are similarly applied, and the mould, with its threefold garment, is put into a drying-room, heated to a high temperature, where it is brought to a dried state. It is removed from the stove-room, filed to give it a tolerable smoothness of surface, and then clothed with three more layers of paper, in the same mode as before. Again is the stove-room employed, again the pasters ply their labour; a third time the stove-room, again the pasters; and so on, until thirty or forty thicknesses of paper have been applied, more or less, of course, according to the substance intended to be produced. For some purposes as many as a hundred and twenty thicknesses are pasted together, involving forty stove dryings, and of course carrying the operations over a considerable number of days. A mass of pasteboard, six inches in thickness, which is occasionally produced for certain purposes, is perhaps one of the toughest and strongest materials we can imagine. If a cannon-ball, made of such pasteboard, were fired against a ship, would not the ball itself escape fracture? The mould being covered with a sufficient layer, a knife is employed to dexterously loosen the paper at the edges; the greased state of the mould allows the paper to be removed from it. Then are all imperfections removed; the plane, the file, and the knife are applied to bring all 'ship-shape' and proper."

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
May 17	3459	Humphreys and Thirst	Chelsea	Flap and drain-mouth for sewers.
18	3460	J. Mackay	Drogheda	Tubular boiler fire-box.
19	3461	Thornton and Son	Birmingham	Lamp.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

May 13	511	T. E. Moore	Great Titchfield-street	Double punch.
18	512	P. Moxham	Granard	Paddle-wheel.

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Edited by R. A. Brooman, 166, Fleet-street.

BROOMAN'S PATENT REVOLVING FIRE-ARMS.

Fig. 1.

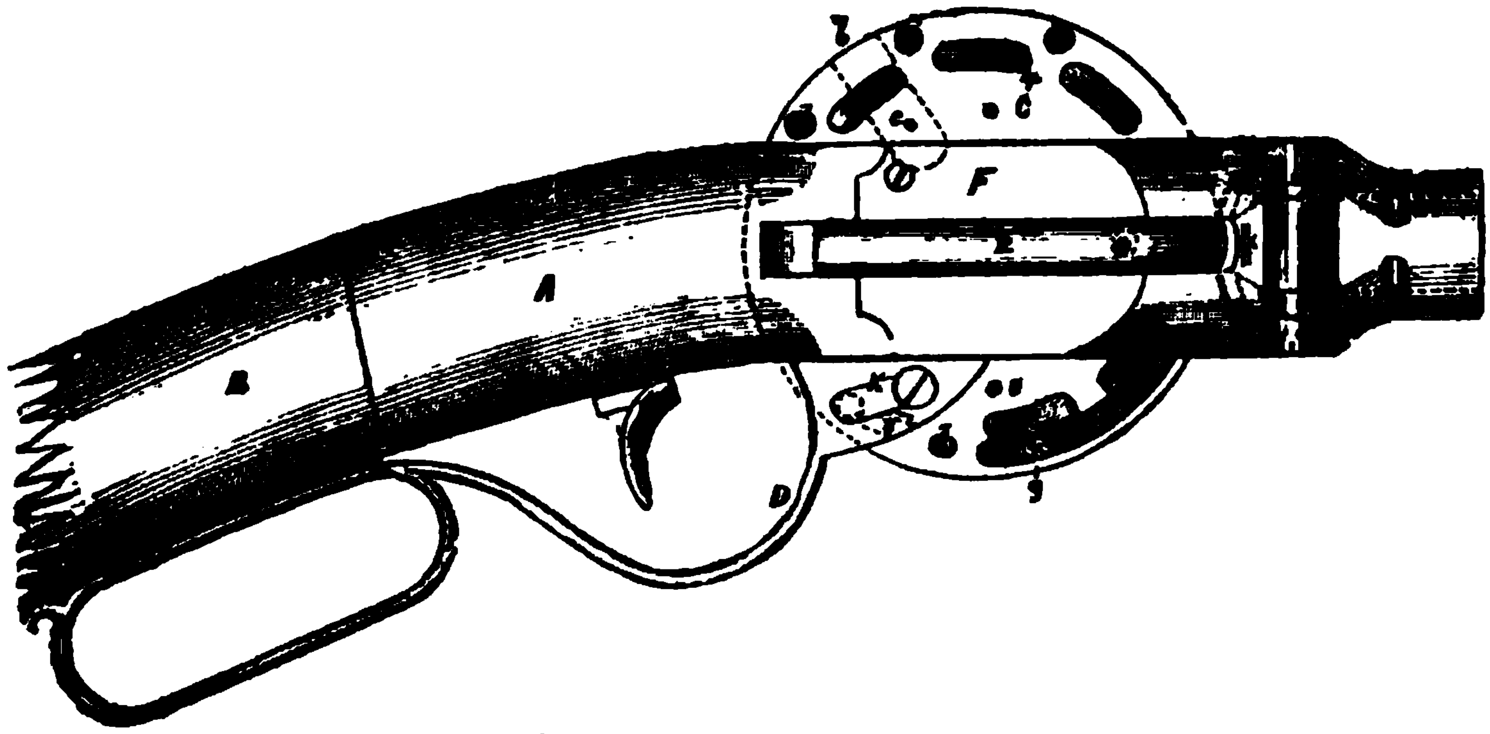


Fig. 2.

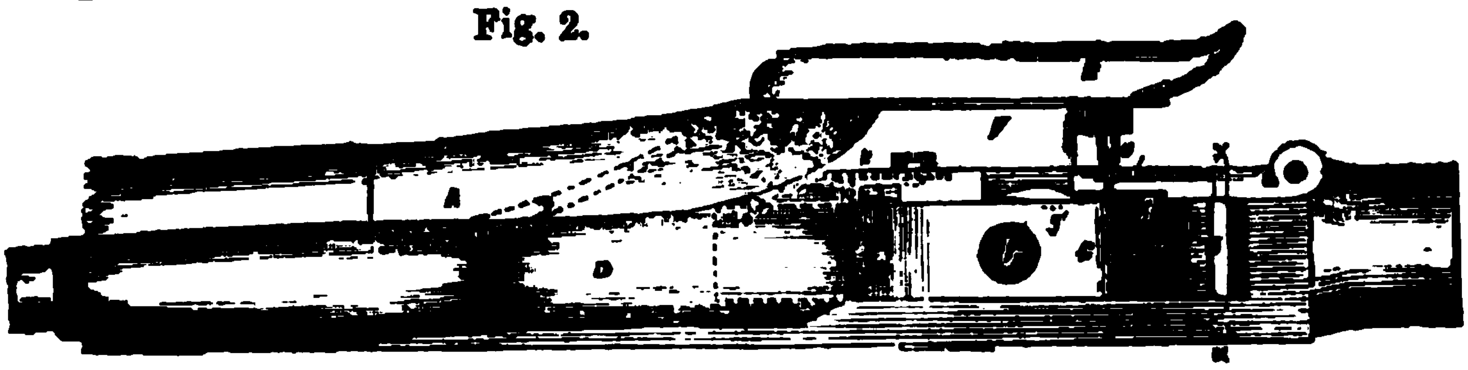


Fig. 4.

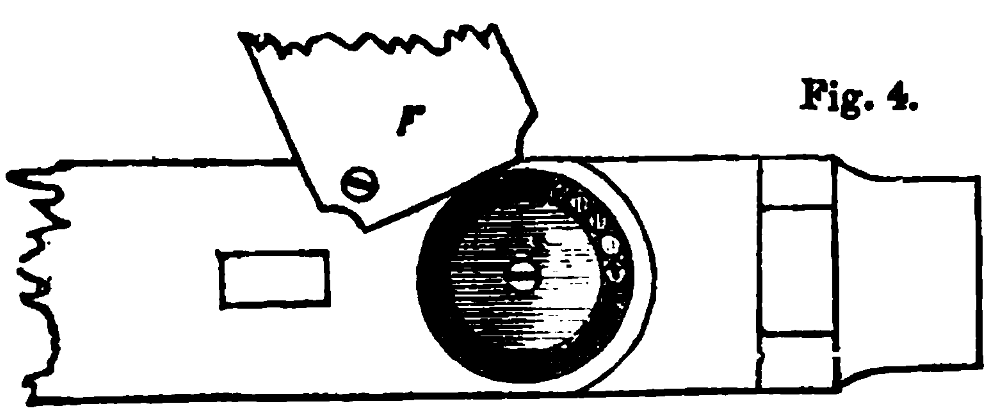
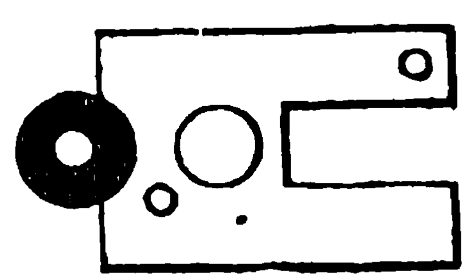


Fig. 5.



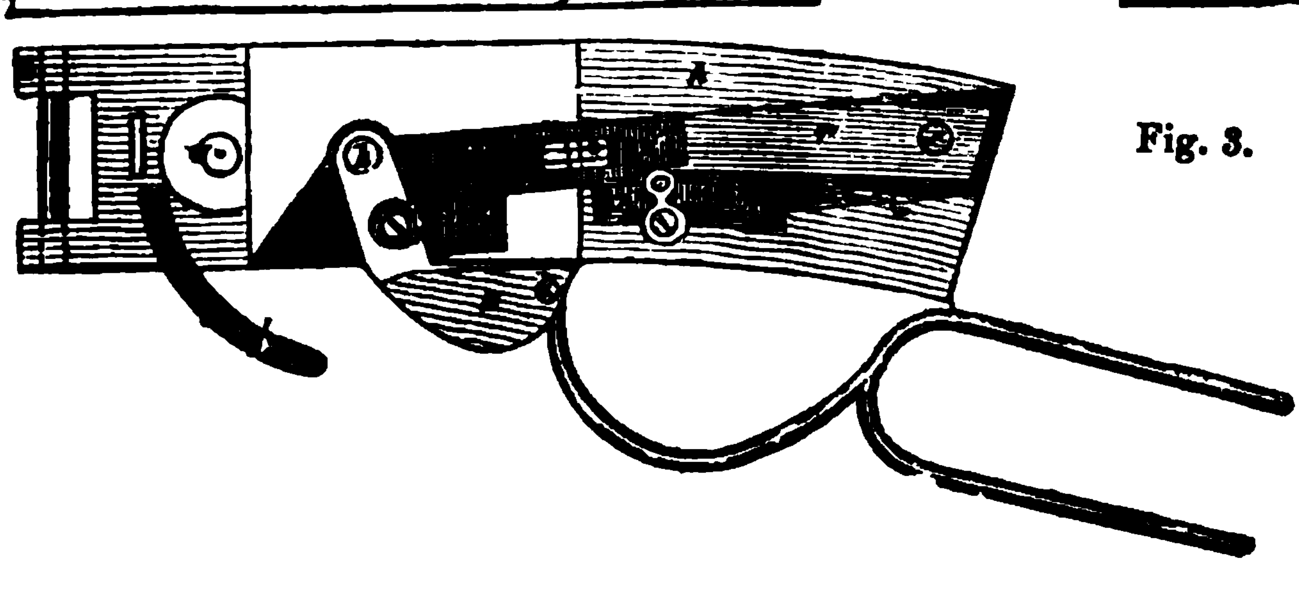


Fig. 3.

BROOMAN'S PATENT REVOLVING FIRE-ARMS.

(Patent dated October 30, 1852.)

This patent, which is a communication from Mr. Porter, of New York, describes a new arrangement of revolving fire-arms, in which the disc, or cylinder containing the chambers for the charges, revolves upon an axis which is transverse instead of parallel to the barrel. The principal features of the invention will be understood from the accompanying figures.

Fig. 1 is a side view of the lock, revolving chamber, and part of the breech; fig. 2 a view on the underside of the same; fig. 3 a sectional view of the lock-plate, showing the works of the lock; figs. 4 and 5 show detached parts; and fig. 6 a view in section of the self-loading flask.

That part of the gun which contains the lock is divided into two parts, the first of which forms the chamber containing the revolving disc which holds the charges, and is permanently fixed to the breech. The other part is the lock-plate, A, which is hinged to the former part at *a*, near the point where the barrel is attached. The back end of the plate, A, fits in the breech by a flush joint, and is secured by a cam-headed bolt and lever worked from the outside, so as to allow it to be attached and detached with facility. When the lock-plate is thrown open on its hinge after firing, as in fig. 3, the revolving disc, C, may be removed from its axis, taken out of the gun, and another similar to it substituted. The piece, C, is a thin cylinder, around the circumference of which a number of holes, *b*, are drilled radially to a certain depth. These holes form the chambers to hold the charges. On that side of the disc, C, which works against the lock-plate, A, are a series of holes and notches, intended to effect the stopping, rotating, and firing. The touch-holes, *c*, go through near the bottom of the charge-chambers; and there is one to each chamber. *d* are the stop-holes, and *e* the notches for receiving the point of the rotating lever. The manner in which these are severally operated upon is as follows:

First, as to the stop. This is a curved spring, seen at *g*, attached to the lock-plate; g^1 is a pin, which, when the lock-plate is closed, presses into the holes, *d*, and thereby holds the disc, C, firmly in its place. The holes, *d*, are so spaced that the disc is always stopped when a charge-chamber, *b*, is exactly in the line of the barrel. Before the disc can be turned round, the spring, *g*, must be moved so as to take the pin, g^1, out of its hole, *d*. This is accomplished by the movement of a long lever, D, the movement of which also effects the rotating of the disc and the cocking. In the edge of the lever, D, is a narrow inclined slot, shown by the dotted lines, *i*, figs. 1 and 2; and by moving the lever towards *g*, the point of the spring enters the slot, *i*, and, riding up on its inclined edge, pushes the spring back, and with it the stop-pin, g^1, is withdrawn from the hole, *d*, thus allowing the disc to be moved. At this point another pin comes into play, to cause the disc to rotate. This pin is affixed to another spring, and attached to the outside of the lever, D, at *k*. The pin passes through a hole in D, and projects through, as shown at k^1, fig. 3. The end of the pin drops into one of the notches, *e*, at the moment of disengaging g^1, and restoring the lever, D, to its first position, draws along with it the disc, C; the extent of the arc described being equal to the distance on the face of the cylinder from the centre of one charge-chamber to that of another. The spring, *g*, being also disengaged from the slot, *i*, presses the pin, g^1, against the side of C, so that it drops into the proper stop-hole, and arrests the disc, C, at the proper place. The catches, E, are holes elongated on one side, so that the bottom forms an inclined plane terminating at the face of the disc. In pushing the lever, D, forward, the pin, k^1, is made to ride out, and form, in fact, a pawl and ratchet arrangement.

The movement of the lever, D, besides performing these operations, also effects the cocking of the piece. In describing this, the construction of the lock will be included. The cocking can, however, be effected independently of the movement of the lever, D, by lifting the hammer back with the finger, as in common guns, and that, too, without changing the position of the disc, C. This is an important feature; for should a cap explode without igniting the charge, as many more caps may be fixed upon the charge as may be requisite, or until the lot in the primer gives out. It also enables the gun to be used as a common one, by loading at the muzzle, and fixing in the ordinary way. Thus if a part of the fire-arm become deranged, it would yet remain useful as an arm of defence. To cock the gun at the time the disc is made to revolve, the lever, D, is brought forward, as before described, and carries with it a sliding-bar or tumbler, *l*, which is connected by a hook, *m*, to D, so that the lever, D, will operate but in one direction upon *l*. The motion is continued until the dog, *n*, drops into the notch, n^1, on the tumbler. As soon as this is done, the piece becomes cocked, the hammer lifted, and ready for giving the blow for firing. The other connections for accomplishing this are, a lever extending from the tumbler, *l*, to the toe of

the hammer. This is attached at one end at o, fig. 3, and at the other to the hammer, as seen in dotted lines, fig. 2. The hammer, E, plays upon the pin, p, fig. 2; a short stirrup, q, connects it to the main spring, r, as usual. The trigger acts upon the dog, n, at r^1, disengaging it from n^1, in order to fire in the common manner. The percussion-caps or pellets are contained in a box outside the lock-plate, and immediately under the hammer, s is a box containing a spiral spring, of such a size that room is left to arrange the cap, t, around the interior. Through both the top and bottom of F there is a hole, t^1, at the place of the cap, t, and beneath that again another in the lock-plate leading to the touch-hole, c, in the disc, being a continuation of the touch-hole. The point, u, on the hammer passes through the priming-box, F, and taking a cap, t, upon it, carries it along to the side of the lock-plate, immediately over the touch-hole, striking upon and exploding it, and the fire passing through the copper of the cap and orifice, u, in the lock-plate leading to the touch-hole proper in the disc, C. In making the cap explode, a small hole is made in its top, which is situated over the orifice, and a minute portion of the copper driven in along with the fire. The rest of the shell sticks to the nipple. As the hammer is withdrawn, these fragments fall off, another cap is forced into its place by the finger, s^1, and the operation repeated as before.

It remains now to describe some safeguards to the gun. In fig. 5 is a plate which fits upon the inside of the lock-plate, so that the part, v, fits around the hole, u^1, against the disc, C. The part v is of steel, and is slightly dished, so that its inner circumference will press upon the disc, and form a tight fit all round. The object of this is to enclose the touch-hole at every fire within this casing, and thus prevent the possibility of the heat communicating to the other touch-holes nearest to it. There are also additional safeguards in this respect by the formation of vents to permit the heat to escape at the place of junction between the edge of the disc and the barrel. The dotted lines, w, fig. 1, are two springs, fastened within a narrow channel, forming angles inclined forward. The lower edges of these springs press upon the circumference of the disc, and form a close joint, keeping the face very clean, and also preventing the passage of fire. The angular direction of the channels forward also carries the heat away from the lock and charge in the disc. Besides the two vents just described, there are two others in the sides, as seen at x. The loading of the disc, if done while in the gun, is effected by a rammer attached to a lever hinged at one end, and bending over the top of the disc, so as to act upon the chambers in a manner common to many kinds of fire-arms.

Fig. 6.

Fig. 6 is a view of the self-loading magazine. This is exteriorly a cylindrical case, G, fitted to an arch which exactly covers the disc above the gun, and is securely fixed in its place. In the interior is a flask, y, having an opening at the top to receive powder; at the lower end is a spout, y^1, having a hinged valve, z, at the mouth, and at the top a second valve, z^1, to cut off, and let in the powder. The spout is calculated to hold one charge, and operate in that respect like a common flask. From the valve, z, a lever extends to the upper valve, so that when z is closed, z^1 opens, and *vice versâ.* This opening and closing is effected by the rotation of the disc thus,—The spout, as shown in the figure, is just over a chamber, and a charge of powder has been let in, and it has now to be moved on to bring another chamber into the requisite position. As the chamber, b, moves

on, the side strikes against the top of the valve, x, closes it, and is kept so, while it rides over the surface of the disc to the next chamber. As x closes, x^1 is opened by the action of the connecting-rod, and thus a charge of powder falls into the spout, y^1, as the next chamber comes under x, drops open, and the powder is discharged into it, and so on. With regard to the balls, j is a spiral plane terminating immediately over the next chamber after the one which has just received the powder. There is a bar across the bottom which passes through from the outside and through the hole, j^1; this bar keeps the bullets back until a chamber comes under which has received its charge of powder; it is then withdrawn, and a ball rolls in. The bullets are dropped in at the top upon the inclined plane, j, until the space is taken up. At j^{11} is an arch which terminates upon the circumference of the disc. The lower half of the ball only enters the hole, but as it is carried along by the rotation of the same, it is brought into contact with the arch, j^{11}, and thus gradually pressed in.

INSTITUTION OF CIVIL ENGINEERS.

Sitting of Tuesday, May 17.

The chair was taken by Joseph Locke, Esq., M.P., Vice-President; and the first paper read was "On the Caloric Engine," by Mr. C. Manby, M. Inst. C.E. (Secretary).

At meetings of the "Société d'Encouragement pour l'Industrie Nationale," on the 26th of January, 1852, and of the "Académie des Sciences," on the 2nd of February, of the same year, Mons. Galy-Cazalat entered upon an examination of the principles of Ericsson's caloric engine, assuming it to be composed of parts analogous to a non-condensing steam engine. After describing these component parts, and their several uses and relative bearings, he gave the following quotation from Ericsson's English Patent of December 26th, 1850:—"The invention consists in producing motive power by the application of caloric to atmospheric air, or other permanent gases or fluids susceptible of considerable expansion by the increase of temperature; the mode of applying the caloric being such, that after having caused the expansion or dilatation which produces the motive power, the caloric is transferred to certain metallic substances, and again retransferred from these substances to the acting medium, at certain intervals, or at each successive stroke of the motive engine; the principal supply of caloric being thereby rendered independent of combustion or consumption of fuel accordingly, whilst in the steam engine the caloric is constantly wasted by being passed into the condenser, or by being carried off into the atmosphere. In the improved engine the caloric is employed over and over again, enabling me to dispense with the employment of combustibles, excepting for the purpose of restoring the heat lost by the expansion of the acting medium, and that lost by radiation also, for the purpose of making good the small deficiency unavoidable in the transfer of the caloric."

These passages would have led to the idea of a perpetual motion, but that the well-known law governing the elastic force of gases at various temperatures demonstrated the erroneous principle on which the presumed economy of the caloric engine was based. It was contended, that if the degree of elastic force of a gas was directly proportioned to the amount of caloric combined with it, a certain mechanical power must be exerted to abstract that caloric from the gas; and no filter could retain any portion without opposing such a degree of resistance as would destroy the economy.

Arguing upon the generally-received dimensions of Ericsson's engine, it was demonstrated, in order to arrive even at a less amount of economy of fuel than had been claimed for the machine, it was requisite that the air leaving the cylinder should traverse the meshes of the metallic web in the "regenerator," without cooling by expansion; or, in other words, preserving the elastic force of two atmospheres, primarily possessed by it, in the working cylinder. But this force being reduced to the sum of the resistances of the atmosphere and of the "regenerator," the sensible heat was reduced by the amount employed in expanding the air, without being usefully transmitted to the metallic web. The result was, that the escaping air carried off almost all its latent heat, expanding into nearly twice its previous volume; the insignificant portion of sensible heat imparted to the metallic web being proportioned to the weight and bulk of the metal, and corresponding with the diminution of the volume of air. It was argued also, that in practice, the caloric engine would be more simple and economical if the "regenerator" was suppressed, and a greater extent of heating surface was given to the air-vessels; as the surface was now so small that two-thirds of the fuel were

uselessly consumed, therefore that any present apparent economy could only be made on one-third of the fuel effectively employed.

In calculating the economy of fuel by the use of the "regenerator," the following formulæ were employed to find its mean temperature before and after the passage of the air:

$$t'' = \frac{tP + T(C + P)}{C + 2P}$$

$$t' = \frac{TP + t(C + P)}{C + 2P}$$

In which

P represents the ratio of the weight of the copper to that of the air;

C, the ratio of the specific heat of air to that of copper;

T, temperature of hot air;

t, „ cold air;

t'', the mean temperature of the regenerator, after the passage of the hot air;

t', the mean temperature of the regenerator, after the passage of the cold air.

The result was, that 245° Fahr. of heat were carried by the air, at each stroke, into the atmosphere.

Quotations were given from a letter addressed by M. Regnault to Colonel Sabine, Treas. Royal Society (dated April, 1853), in which he stated that he was about to publish, immediately, a series of elaborate experimental researches on various subjects connected with the effects of heat on elastic fluids; the results of which would solve many questions long in dispute, and by means of which engineers might accurately calculate the effect of a given amount of fuel, in whatever way it was applied. M. Regnault communicated in anticipation that he had arrived at the number 0·237, for the specific heat of air at constant pressure, and at 0·475, for that of steam under atmospheric elasticity, the specific heat of water being taken in each case as unity.

The next paper read was "On the Principle of the Caloric, or Hot-air Engine," by Mr. J. Leslie, M. Inst. C.E.

The main objects of the author were to show that the regenerator, or, as he contended it should be called, the "economiser," was based on the correct principle of the rapid equalization of temperature of two bodies of unequal temperatures, when brought into contact, and that it was practically productive of economy of fuel; that the date of the production of Stirling's air-engine was antecedent to that of Ericsson; and that the former was decidedly superior to the latter in the general arrangement, in the details of construction, and in the general efficiency.

If it was admitted that the wire gauze or thin plates did absorb the heat in the passage of the air in one direction, and give it out again on its return, it was contended at some length that there must be economy of heat, unless the mechanical power required to drive the air through and between the metallic webs in the regenerator was greater than the advantage to be derived from the alternate heating and cooling. It was contended that the required force was in reality very insignificant, that it did not increase in proportion as the density of the air was augmented, and that by the removal of the regenerator the air-engine would lose its power and its economy; that Stirling's air-engine, at Dundee, did act efficiently, for some years, and was only at last abandoned from the difficulty of preventing the bottoms of the air-vessels from being destroyed by the direct action of the fire.

The apparatus called "Jeffrey's Respirator" was instanced as an analogous application of the alternate heating and cooling of air in its passage between metallic surfaces. It was contended that to Dr. Stirling was due the merit of the invention of the economising process, on which the air-engine was based; whilst to his brother, Mr. James Stirling, M. Inst. C.E., must be conceded the practical reduction of the bulk of the engine, by using compressed air, the latter improvement having been patented in 1827, and with other ameliorations in 1840; that Stirling's engine was more compact than Ericsson's, and occupied less space, owing to the use of air compressed to seven or ten atmospheres, which increased the power of the machine directly in the ratio of the density of the air; and that in Stirling's engine the working cylinder being a separate apparatus, connected only with the cool end of the air-vessels, it never became heated to such an extent as to occasion the difficulty of lubricating, which had proved so prejudicial in Ericsson's and other engines.

The third and last paper read was "On the Conversion of Heat into Mechanical Effect," by Mr. C. W. Siemens.

In the first section of the paper the abandonment of the prevailing theory, that heat was material (though imponderable) was insisted upon, and it was shown to be untenable, by Sir Humphrey Davy's experiment of melting two pieces of ice by friction against each other; by the experiment of Dulong, proving that although heat was absorbed in the expansion of gases, the specific heat of the gas was not

thereby increased; and by the experiment of Joule, of Manchester, who produced heat in several ways by mechanical effort only.

The "dynamical theory" was supported by proofs derived from French, German, and English authors of the present day. It was explained that, according to that theory, heat was vibratory motion of the material particles of either solid, liquid, or gaseous substances. In the gases this motion was so great that it completely destroyed cohesion between the particles, on which account they were better adapted to the production of mechanical effects by heat than either liquids or solids. The elastic pressure of a gas was explained to arise from the impact of the vibrating particles against the sides of the containing vessel.

If the side yielded to the pressure, as was the case with a working piston, then the rebound of the particles would be less than their impact, and their length of vibration would diminish in proportion to the onward motion or the mechanical effect produced. The length of the vibrations determined the temperature, and their frequency the specific heat of a body. The product of the two multiplied by the weight constituted the *vis viva*, or latent mechanical force, and might be numerically expressed, if the specific heat of the substance was accurately known. It was argued that the same heat must always yield, in its conversion, the same mechanical effect, no matter what the nature of the material employed might be. In illustration, a formula was given, which expressed the horse-power of any steam or air-engine by the temperature lost in the working cylinder, which formula was recommended for practical use, instead of the more complicated and uncertain method usually employed for ascertaining the force of expansive-engines.

The total power to be derived from an expansive steam engine was illustrated by a diagram, from which it appeared that the full theoretical equivalent for the heat employed might be obtained theoretically, though not practically, provided the steam was admitted into the cylinder at the pressure of about 18,000 lbs. per inch, or of equal density with the water producing it, and was allowed to expand to at least 18,000 times its original bulk below the working piston. Its temperature would, during this expansion, fall from 1,200° to to 100° Fahr.; and it was shown that each degree yielded an equal share of power. The specific heat of steam was shown to be much greater than was generally supposed, and the supposition lately advanced by Rankine and Clausius, "that steam partially condensed in expanding" was held to be erroneous in consequence, and was certainly not corroborated by the form of actual indicator diagrams which were exhibited.

In the second part of the paper the practical and theoretical conditions of air-engines were examined and illustrated by diagrams. The result arrived at in this examination of the general case of an air-engine, consisting of an air-pump, a heated reservoir, and a working cylinder, into which the heated air was admitted for such a portion of the stroke as to obtain the maximum expansive action, was, that "theoretically it was not superior, and practically it was much inferior, to an ordinary condensing steam engine." There was, however, this important difference between the two classes of machines, that the unproductive portion of the heat required by the steam engines was expended in the boiler, effecting increase of bulk without displacement of piston; whilst in the air-engine it presented itself at the exhausted port in its free (sensible) state, and might be usefully employed in partially heating the fresh supply of compressed air to the cylinder.

The air-engine by Stirling, of Dundee, was investigated at considerable length; and it was shown that, although its distinguishing feature, the respirator or regenerator, was both theoretically and practically an efficient means of recovering the unproductive heat of an air-engine, the advantage was lost in the great back pressure against the working piston, and in the air which remained in the displacing cylinders.

Ericsson's new engine was next examined, and was shown to be the primitive air-engine, with the addition of Stirling's respirator or regenerator; and it was argued that while, theoretically, it was somewhat superior, it must, practically, be considered as much inferior to Stirling's engine, in consequence of the heated working cylinder, the low-working pressure (which was shown not to exceed 1¼ lbs. average pressure upon the up and down stroke of the working-piston), and the utter inadequacy of heating surface, which was limited to the bottom area of the working-cylinder and the passage leading to the regenerator. The latter defect applied also to Stirling's engine, and was accounted for by apparent misapprehension of the principle involved.

The duty to be obtained by the different engines, expressed in pounds lifted 1 foot high, for the unit of heat, or heat required to raise the temperature of 1 lb. of water through 1° Fahr., was shown thus:

	Theoretical.	Actual.		In lbs. of Coal per H. P.
1. A theoretically perfect engine	770	about	350	0·66
2. The Boulton and Watt condensing engine	51·8	by rule	29	8·00
3. The best Cornish engine	158	Pambour	82	2·38
4. The expansive air-engine	91	about	45	5·15
5. Stirling's ditto	167	„	71	3·26
6. Ericsson's ditto	196	„	60	3·86

In conclusion, the author referred to his own experiments and practical experience of several years, and enumerated the necessary characteristics of a machine, which, in his opinion, would constitute the most perfect engine, and with different applications of the respirator or regenerator.

The following papers were announced to be read at the meeting of May 24th:—"Description of the Newark Dyke Bridge, Great Northern Railway" (Discussion on the Principle of "Warren's Girders"), by Mr. J. Cubitt, M. Inst. C.E.; and "On the Speed and other properties of Ocean Steamers," by Captain A. Henderson, Assoc. Inst. C.E.

Sitting of May 24th.

The chair was taken by James Meadows Rendel, Esq., the President; and the paper read was "A Description of the Newark Dyke Bridge, on the Great Northern Railway," by Mr. J. Cubitt, M. Inst. C.E.

This bridge, for carrying the Railway across a navigable branch of the River Trent, near Newark, was described as being erected at a point where the line and the navigation intersect each other, at so acute an angle, that although the clear space, measured at right angles between the abutments, was only 97 feet 6 inches, the actual span of the girders was 240 feet 6 inches. The structure consisted of two separate platforms, one for each line of rails, carried upon two pairs of Warren's trussed girders, each composed of a top-tube strut, of cast iron, opposing horizontal resistance to compression, and a bottom tie, of wrought-iron links, exerting tensile force. These were connected vertically, by alternate diagonal struts and ties, of cast and wrought-iron respectively, dividing the length into a series of 14 equilateral triangles, whose sides were 18 feet 6 inches long. The top-tubes rested upon the apices of equilateral or A frames, fixed on the abutments; and each pair of girders were connected by a horizontal bracing at the top and bottom, leaving a clear width of 13 feet for the passage of the trains.

Each tube was composed of 29 cast-iron pipes, of 1¼ inch metal and 13½ inches diameter at the abutment ends, increasing to 18 inches diameter with 2⅝ inches metal at the centre of the span,—the ends of the pipes being accurately turned and fitted, so as to give exact contact of the surfaces, where they were connected together by bolts and nuts. The lower tie consisted of wrought-iron links 8 feet 6 inches long, of the uniform width of 9 inches; but varying in number and thickness according to the tensile strain to which each portion was subjected; the abutment portions having each four links of 9 inches by 1 inch, and the centre-piece 14 links of 9 inches by ⅞ inch. The diagonal tie-links varied from 9 inches by 1⅛ inch to 9 inches by ⅞ inch; and, in order to accord with the relative strains, were distributed in groups of four, for the first three lengths from the ends, and then in couples for the next four lengths on each side of the centre.

The cast-iron diagonal struts had a section resembling a Maltese cross, the area being in proportion to the compressive force to which they were subject. The bearing-pins at all the intersections were 5½ inches diameter, carefully turned and fitted into bored holes. The links of the lower tie were supported, in the middle of each length, by a pair of wrought-iron rods, 1¼ inch diameter, suspended from each side of a joint-pin traversing the top tube; and by means of nuts and washers they could be made to bear a portion of the weight of the platform of the bridge. The trusses were so arranged that all the compressive strains were received by the cast-iron, and all the tensile force was exerted by the wrought-iron; the proportions being such that when the bridge was loaded with a weight equal to 1 ton per foot run, which considerably exceeded that of a train entirely composed of the heaviest locomotive engines used on the Great Northern Railway, no strain could exceed 5 tons per square inch of section.

The total weight of metal in each pair of girders, composing the bridge, was 244 tons 10 cwt., of which 138 tons 5 cwt. were cast iron and 106 tons 5 cwt. wrought iron, which with 50 tons for the platform, &c., made the total weight of each bridge 294 tons 10 cwt., or 589 tons for the whole structure; and the cost, exclusive of the masonry of the abutments, and of the permanent rails, but including the staging for fixing and putting together, and the expense of testing, was 11,003*l*.

In a series of experiments to test the stability of a pair of the trussed girders, at

the works of Messrs. Fox, Henderson, and Co., where they were constructed, the following results were obtained:—With a weight of 446 tons regularly distributed, which was equal to 1¼ ton per foot run, plus the weight of the platform, rails, &c., lowered seriatim on the thirteen compartments, the ultimate deflection in the centre was nearly 6¼ inches. With a weight of 316 tons, equal to 1 ton per foot run, plus the weight of the platform, &c., as before, the ultimate deflection at the centre was 4½ inches. When the bridge was fixed in its place, a train of wagons loaded up to 1 ton per foot run, extending the whole length of the platform, caused a centre deflection of 2¾ inches. The deflection caused by two heavy goods engines, travelling fast, and slowly, was 2½ inches; and that produced by a train of five of the heaviest locomotive engines, used on the Great Northern Railway, was 2½ inches in the centre.

The proportions of the several parts of the structure were originally given by Mr. C. H. Wild (Assoc. Inst. C.E.), and had been only slightly modified by the author during the execution of the work.

THE TRADES OF BIRMINGHAM.

The Britannia metal, iron tubing for locomotives, general hollow ware, iron wire, and brass tap trades are all said to be extremely brisk, and in some a great and speedy increase is anticipated. For plated metals there are now large orders in hand for America and Australia. The tool trade, more particularly for exportation, is at the present time more particularly active, and, as a matter of course, denotes the general activity of other industrial trades throughout the country. A new and extensive manufactory of iron and brass bedsteads has been established in the neighbourhood of Soho, and such is the prosperity of the saddlers' ironmongery business in Birmingham that a new manufactory and warehouse, much larger than ever before erected in the town, is now nearly completed and ready for occupation.

In some branches of the copper trade business continues extremely good, but in others, owing to the unsettled state of the metal-market, the manufacture is flat. A reduction of price had been expected to take place within the last fortnight, and orders had consequently been suspended in anticipation of this decline. On Tuesday, however, at the meeting of smelters, there were no reductions declared, but the market was evidently weak; and had it not been for the favourable reports from the continent, respecting an advance in price in some of the most important places, and the non-arrival of heavy consignments which were expected at Hull, a material reduction must have taken place. Some orders have, however, been executed during the week at a reduction, and the great probability, if not certainty, is, that a still further decline may be looked for. A valuable discovery of copper ore has been made at the Royalage Copper Mines in Staffordshire. Within the last few days, Mr. Mathew Francis, and Mr. John Rowefloyd, have made an examination of the mines. Their report is highly satisfactory; and will, no doubt, lead forthwith to the establishment of a company capable of working it with success. The mine is situated in the parish of Alstone-fields, in the county of Stafford, in the middle of the great copper deposits of the county, and is represented as the outcrop of a formation of copper ores, similar to those of the Ecton Mixon and Burgoyne Mines, which have been heretofore known as amongst the most productive mines in the kingdom. The site of the mine is upwards of 300 feet above the level of the sea. A shaft is being sunk, and the water is being drained by a large steam engine, worked by the New York Mining Company.

The tin trade remains about the same as last week, but the consumers buying only from day to day, in anticipation of a reduction. Manufacturers in the various branches are busy, particularly in preparing Australian orders. There is a large quantity of gold at the refiners', and the jewellers are working over-time in manufacturing every description of fancy articles usually made from the precious metal, which are to be sent out to Sydney, Melbourne, and the other fortunate localities of the Gold region. There are large nuggets being forwarded to Birmingham every week, with special injunctions that they shall be manufactured into particular articles; and in some instances guarantees are required for the faithful execution of the work, so anxious are the gold-finders that their friends shall be in possession of some portion of their good fortune.

Society of Arts.—We understand that one of the candidates for the office of Secretary of the Society of Arts, rendered vacant by the resignation of Professor Solly, is Mr. Peter Le Neve Foster, for several years one of the most active members of the Society, and a Vice-president. We may also remind our readers that Mr. Foster was one of the Treasurers of the Great Exhibition, and an Examiner under the Protection of Inventions' Act, in 1851. Mr. Forrest, the Assistant-secretary of the Society, is also a candidate.

THE IRON TRADE.

The iron trade of South Staffordshire may be described as a shade weaker than it was a week ago. The *Birmingham Journal* of Saturday morning, states the matter pretty fairly in the following terms:—"Some very gloomy rumours are afloat as to the position and prospects of the iron trade. We have taken some pains to ascertain the exact condition of things, and although there is some uncertainty about the maintenance of the present prices, there seems to be no justification for any apprehension of a serious decline. The uncertainty referred to is caused by recent speculations. These purchases consisted not in the purchase of iron ready made, and bought at a certain price—that was not the sole nature of the transaction—but in contracts for iron not then made, and, in fact, not made yet. Now, if the makers who took these contracts insist upon their fulfilment and the delivery of the iron, then an immense amount of pig-iron will be thrown upon the market, which must affect it to a considerable extent. But if, on the other hand, the makers can be induced to abandon the contracts, then the stock of iron will not be larger than is required for the legitimate trade. Some of the furnaces in the district are not at the present moment in full work, and that may be accounted for by the circumstance that purchasers are withholding orders in expectation of a reduction of price. There may be some foundation for this expectation: but it is believed that if any reduction does take place it will not at the very outside exceed 10*s.* per ton. Many, however, believe that the present prices may be maintained. Speaking generally, there is nothing like very gloomy prospects for the trade, as has been alleged; nor is it likely that it will be affected to any extent by the recent speculations, beyond what has already occurred. Mr. George Hudson suffers rather severely, although not to the extent generally reported." It may be mentioned that a number of the ironmasters in the district do not work their furnaces on a Sunday; which plan, if carried out by all, would lessen the make of iron and cause the pig trade to be more healthy, besides giving an opportunity to a great number of people to spend the Sabbath in a more agreeable manner.

Glasgow Pig-Iron Market.—Glasgow, May 21.—We have had a most inactive week in pig-iron, and prices have scarcely deviated from the quotations of this day se'nnight. Speculation appears dormant, and the only transactions which have taken place have been for shipment, or to supply the immediate wants of our local consumers. Warrants, mixed numbers, held at 51s., buyers 50s. 6d.; No. 1, g. m. b., 51s. 6d. to 52s.; Glengarnock 53s., Gartsherrie 55s., bars 8*l.* 10s. to 9*l.* less discount.

America.—By the *Canada*, which arrived at Liverpool on Sunday with advices from New York to the 10th, and from Boston to the 11th inst., we learn that the iron-market was inactive. The United States Mail steam ship, *Pacific*, which arrived at Liverpool on Sunday, brings advices which represent as the state of the New York iron-market on the 14th inst., that Scotch pig-iron was dull, sales had been made at 31 dollars to 33 dols., and other descriptions had been sold in moderate quantity at prices in favour of the buyer.

RECENT EXPERIMENTS WITH SHOT AND SHELLS.

An extensive series of experiments have been instituted in Portsmouth Harbour during the past week, with a view to ascertain the probable effects of the general introduction of shells in warfare afloat. The firing took place from the *Excellent*, upon the old hull *York*, 74, and on Saturday his Royal Highness Prince Albert, arrived in the *Fairy* from Osborne to witness the practice. The experiments were highly interesting; and the following have been among the observed results:—Shot being fired at shells fixed in their places ready for action on board the hulk, the shells in two instances were broken, and fragments thrown along the decks, the fuzees not ignited, but the powder exploded by sparks from the friction of broken cast iron. With hollow shot, the results were the same; the shells were split as before, but not burst, no ignition of the fusee having taken place. Hollow 10-inch shot were split also in like manner. In one instance the powder was scattered, but not ignited, and several live shells were thrown out of their boxes uninjured. Some shot, at a short range, fired a pile of shells, one of which split, causing the explosion, by friction, of the bursting powder, which, driving off the fuzee-caps of two other shells, fired the fuzees, and exploded the two. After the fuzees had properly burnt their time, other shells were thrown to the right and left, but were uninjured. Shells were also fired at the hulk, while powder-cases, with the usual two cartridges, were placed, as if in charge of the boys; the cases were thrown about, but the cartridges were not fired by the explosion. These experiments are to be continued, and no expense is to be spared to ascertain practical results of this nature.

THE UNITED STATES EXPLORING AND SURVEYING EXPEDITION.

In a recent number we called attention to the overtures of the American Government to that of this country, as disclosed in the official correspondence between the two, and the reference to the Royal Society, with the object of establishing, in concert with us, and with other maritime powers, an extensive and organized system of scientific ocean observation and surveying. Since then, the subject has been brought under the notice of the Government, in the House of Lords, by Lord Wrottesley; with what effect most of our readers are probably aware. That noble lord gave a comprehensive and well-conceived outline of the nature of the observations intended, and a tolerably substantial idea of the advantages that would result, not only in the shape of tangible profit as a new commercial appliance, but indirectly as advancing the range of science in a direction almost altogether untrodden. As the question now presents itself to us, we must consider that our Government are sufficiently persuaded that the undertaking is desirable, and in itself worthy of Government support, but that it is of such a nature that it had better be left to the voluntary enterprise of private individuals. Contrasted with the practical rejection of the proposed system of ocean observation, we feel pleasure in contemplating the persevering endeavours of our transatlantic brethren to carry it into effect, which we trust will not only be successful in themselves, but so practically demonstrative of its utility, if not of its necessity, as to bring about a national recognition of it on our own part, and a cordial participation in the necessary trouble and expenditure. To present our readers with a sketch of the expedition just fitted out by the American Government for the purpose, we abridge a long account of the whole subject which we find in the *New York Journal of Commerce*:

This expedition promises to be one of the most important in its results to the commercial and scientific world which has taken place for very many years past; and, indeed, may be favourably compared with any others which have been despatched within the last half century. It consists of five vessels, under the command of Commander Cadwallader Ringgold, which have been equipped, rigged, and manned with a view to the peculiar service for which they are designed; a service of the utmost importance, not only to our country, but to the entire world, as it is intended to examine and survey a large portion of the North Pacific Ocean, Beering's Straits, and the Arctic Sea, so far north as may be found practicable, together with the adjacent coasts of America and Asia—these surveys having for their object the promotion of commerce and of the whaling business in those greatly frequented, but slightly known regions. The necessity and high importance of such an examination as is here contemplated becomes the more apparent from our recent acquisition of California and the magnitude of our whale fishery—the establishment of a commerce which is fast increasing between the United States' ports on the Pacific and those of China. It is evident that an interest so extensive and valuable merits all the aid which our Government can, consistently with its other duties, afford to it; and, therefore, that the localities and true position of the Aleutian Islands, which stretch nearly across the Northern Pacific, and from the Southern boundary of the Beering or Kamtschatka Sea, and the Kurile Islands, which extend from Japan to Kamtschatka, should be examined and defined; and also that the sea of Okhotsk, the islands of Japan, with the adjacent seas, as well as the Gulf of Tartary, and the approach and entrance of the large river Amour, should form a portion of the scientific labours of this extensive survey.

All this labour, immense as it seems to be from this detail, is to be performed by this expedition, and it is expected that they will be thus occupied for a period of between four and five years. It is a matter of congratulation to those who feel a strong interest in the progress of knowledge that the duties of this survey have devolved upon gentlemen who are fully qualified to discharge them with efficiency and to the satisfaction of all concerned. These officers are not novices in scientific surveys and examinations. Commander Ringgold, now at the head of the expedition, was commander of the *Porpoise*, in the exploring expedition under Commander Wilkes; Lieutenant H. Rolando commands the *Vincennes*, the flag-ship; Captain Davis, now commanding the *Porpoise*, was also an officer in the exploring expedition; Lieutenant Stuart, the secretary and assistant-astronomer, was the draughtsman of the exploring expedition; Captain Rodgers, now commanding the steamer *John Hancock*, is also advantageously known as a gentleman of fine scientific mind and attainments. And thus it will be found that, although the officers and scientific corps may be few in number, they are probably more efficient than that of any previous expedition of a similar character. Notwithstanding this expedition is provided with an efficient scientific corps, it is believed, and we may say

understood, that the primary objects of this noble enterprise—the great naval and commercial interests of our country—will never be sacrificed for the less important scientific pursuits; but, where time and opportunity will allow, the gentlemen of the corps will prosecute their researches in their respective branches of science with an assiduity which will add much to the present amount of knowledge in natural history. We understand, and we hope our belief may prove correct, that arrangements will be made to facilitate sending home copies of all surveys, together with other interesting information, so that the community may reap the benefit of this enterprise at the earliest possible moment.

Having shown briefly what is designed to be effected, we will now speak of the means to be used in carrying it into effect. The expedition, as we have before stated, consists of five vessels—viz., the *Vincennes* sloop of war, now converted into a bark; the steamer *John Hancock*, of about 800 tons, bark-rigged; the brig *Porpoise;* the survey and supply ship *John P. Kennedy*, of about 500 tons burden, and also bark-rigged; and the schooner *Fennimore Cooper*, an elegant model of a pilot-boat, about 90 tons. All the boats of the squadron, especially the launches, are whale-boats, and all of them, as well as the vessels themselves, carry heavy armaments. Each vessel is also furnished with life-buoys, with port fires attached, a number of India-rubber boat-floats, and a full supply of life-preservers.

Among the additional means of carrying into effect the objects designed, the expedition is provided with the most improved astronomical, surveying, and magnetic instruments, most of which have been manufactured in the United States, and with the utmost care and accuracy, and they have been very highly spoken of by all who have had the gratification of seeing them. The chronometers, about thirty in number, are of the best quality which could be procured. Some of them were made by one of our enterprising manufacturers in the city of New York. Besides the complement of the officers of the navy, who, under the direction of Commander Ringgold, will have charge of the astronomic, hydrographic, and magnetic departments, an efficient scientific corps is attached to the expedition. All the departments of natural history will be attended to. Competent draughtsmen are also provided; and among the scientific gentlemen, there are a photographist, chemist, a taxidermist, an artist, and a mathematical instrument-maker. In truth, care has been taken in the organization of this service to furnish it with every means of success. Each officer is capable of performing more than one scientific duty in addition to the regular duties of his position; and with all this, and from our knowledge of many of the gentlemen engaged in this great enterprise, we cannot see how it can possibly fail of rendering eminent service to the cause of science, and of benefiting in a high degree their country and the world, as well as adding very much to their own fame and honour.

We have had the pleasure, and a great one it truly was, of visiting and inspecting the arrangements of the principal ship of the squadron, the *Vincennes*, more than once. She is fitted up especially under the eye of Commander Ringgold, and a more beautiful, comfortable, and splendidly arranged ship probably was never before seen. Her beauty and splendid arrangements do not consist in tawdry colours and gilding,—she has nothing in her but plain white and mahogany; but it consists in having "a place for everything, and everything in its place," and in the occupation of every possible nook and space for some valuable purpose. A more perfect arrangement and disposition could scarcely have been devised. In the cabins of this ship are contained a most valuable library of scientific and other works, voyages, histories of previous expeditions, &c., consisting of about 1,000 volumes. The library is for the use of the officers alone. In the midships is another library, intended for the use of the seamen; showing that every care has been taken to render this long voyage interesting, not only to those in command, and to the scientific gentlemen, but also to poor Jack.

In the departure and success of such an expedition we must all feel the utmost solicitude, and entertain heartfelt desires for the full accomplishment of all the objects designed by the Government in its organization; and that such will be the result, so far as the same may depend upon the officers themselves, and the scientific corps associated with them, we fully believe.

[The expedition sailed from New York on Sunday, the 8th instant, for Norfolk, which is to be the rendezvous of the vessels before their departure to the scene of their operations.]

The Caloric Engine.—The *Humboldt*, which arrived off Cowes from New York on Wednesday the 18th inst. and proceeded on her voyage to Havre after having landed her mails and passengers, had on board a 10-horse power caloric engine, belonging to Captain Ericsson, to be put into operation in France, to secure the patent in that country for the caloric principle.

ON THE MANUFACTURE OF GAS FROM WOOD OR TURF.

(Communicated by Mr. John Ayliffe, junior, of Moscow.)

The annexed figure is a side-view of a retort-bed for three retorts, with its appurtenances, for making illuminating gas from wood or turf; which I consider to be worthy of notice, as it may be of great service in countries where wood or turf is cheap, and lime and coals difficult to be got. It has the great advantage, moreover, of not requiring purification. According to many experiments which I have made in Moscow, I find that the gas from wood is a great deal cheaper than that from coals; that it is not so injurious to health; that the retorts may be worked much longer; and that six times the quantity of gas can be made in the same time, with the same number of retorts. The following is the explanation of the figure:

A A is a retort-bed, with three retorts, *a*, *a*, *a*, into which the wood is placed to be carbonised. *b* is the ascending and dip-pipe, by which the gas is conveyed into the hydraulic main, *c*. *d* is a pipe, through which the gas is made to pass into the bail, *e*, which is fixed in the bed, and heated to a dark-red heat. The gas passes from this

ball into the naphtha-cistern, *g*, in the basement of the works, through the pipe, *f*, which conveys the liquid passing over with the gas into the cup, *n*. The cup, *n*, stands in the box, *m*, which acts as collecting-box for all refuse. *h* is an inverted bell in the cistern, *g*, intended to spread the gas; so that it may be well washed with the naphtha, or with coal-tar and 6 per cent. of turpentine. *l* is a cock, to try the height of the naphtha in the cistern, *g*; and *j* is a funnel, by which the naphtha enters that vessel. I is the outlet-pipe, which conveys the gas to the condensers, where it may be stored for use without requiring purification.

APPLICATION OF THE ELECTRIC TELEGRAPH TO THE DETERMINATION OF THE LONGITUDE.

Within the last fortnight, an extensive series of experiments have been instituted with the electric telegraph, in order to determine the longitude of Cambridge Observatory from that of Greenwich. It will be seen from the account of these experiments which we now give, and which was communicated by Professor Challis, of the Cambridge Observatory, in a letter to the editor of the *Times*, that they have been conducted on a very comprehensive scale; chronometers, astronomical clocks, and transit instruments having been employed, and every precaution taken to eliminate the "personal" and other errors from the several observations. The result is one of considerable importance, as establishing the efficiency of the method of telegraphic signals in the determination of differences of longitude, which will lead, no doubt, to the immediate revision and critical correction of tables of longitude, and to other obvious objects of interest and utility in science and in engineering.

The letter is dated from Cambridge Observatory, May 19, and states that this is the first instance of the application of the electric telegraph being applied to such a purpose in England, and the professor believes he may add, in Europe. The method was first put in practice by our enterprising scientific brethren of the United States of America; and there can be little doubt that, from its practicability and accuracy, it will be extensively used for geographically connecting astronomical observatories.

Mr. Challis describes the operations in these terms:

The plan of making the experiment was arranged by the Astronomer Royal, and in principle is very simple. Two needles, one at the Greenwich Observatory and the other at Cambridge, were made to start by completing the galvanic circuit at either station. This was the signal. The instants of starting, which practically are identical, were noted at the two stations. The noted times, reduced exactly to Greenwich Observatory time and Cambridge Observatory time, give by comparison the longitude of the latter Observatory from Greenwich. The Astronomer Royal is provided with means on the spot of transmitting such signals along any line of railway that is telegraphically connected with Lothbury, and his signal-needle is very conveniently attached to the case of the transit-clock. Not having the same means at command, I was obliged to transfer the Cambridge Observatory time, by chronometers, to the Telegraph-office of the railway station at Cambridge, and to note the signal times by a chronometer. Some little inconvenience was felt from the noise inseparable from a railway station.

The Electric Telegraph Company most promptly and liberally permitted me to avail myself of their telegraphic communication with Cambridge. Mr. Edwin Clark, chief engineer, kindly placed a wire exclusively at our disposal, and Mr. Sach, engineer of the Eastern Counties telegraph, made the requisite arrangements of the galvanic apparatus, and was present during the whole of the observations, making the connections proper for giving or receiving signals.

On May 17, from eleven to twelve P.M., 151 signals were transmitted in 29 batches, intervals between the batches being allowed for the observers to take rest, and for giving warning of the number of signals that were coming. The signals were sent alternately from the two stations during intervals of a quarter of an hour. On May 18, from eleven to twelve P.M., 139 signals were similarly sent in 22 batches, the Cambridge and Greenwich observers having in the meantime changed places. This was done to eliminate in the final result the effect of any constant error or personal equation, as it is termed, between the noted times of the two observers. It was also arranged that, if the state of the sky permitted, the same stars should be observed for clock errors by both observers on the two days, for the purpose of eliminating personal equation from the clock errors. The nights of May 17 and 18 allowed of this being done. Each station had a signal-giver, in a separate part of the room from that occupied by the signal-observer. The signal-giver at Greenwich had the means of observing the pas-

sage of a star across the field of the transit-telescope, and giving signals at the same time, and in several instances his signals were made at the instants of transit of a star across the wires of the telescope, so that a transit observation taken at Greenwich was actually recorded at Cambridge.

Too little time has elapsed since the observations were made to allow of stating the numerical result. I consider, however, the experiment to have sufficiently proved the practicability and efficiency of the method of telegraphic signals for the determination of terrestrial longitudes.

Meteorological Observations.—At the Royal Observatory, Greenwich, the mean height of the barometer in the week was 29·760 in. The reading of the barometer decreased from 29·73 in. at the beginning of the week to 29·55 in. by 9h. p.m. on the 16th; increased to 29·85 in. by 9h. a.m. on the 19th; remained at this reading till 9h. p.m. on the 19th; increased to 29·94 in. by 9h. p.m. on the 20th; and decreased to 29·91 in. by the end of the week. The mean temperature of the week was 55·2°, which is 2° above the average temperature of the same week in 38 years. The mean daily temperature rose from 50·4° on Sunday, when it was below the average, to 59·5° on Thursday, which is 6·1° above it; it again declined on the last two days to 53°. The highest temperature, which was 72°, occurred on Wednesday and Thursday; the lowest occurred on Saturday, and was 38·5°, showing a range of 33° in the week. The wind blew for the most part from the north-east. The greatest difference between the dew-point temperature and air-temperature was 17·3° on Saturday; the least occurred on Monday, and was 1·8°; the mean of the week was 9·7°.

THE GOVERNMENT STEAM-WORKS AT KEYHAM HARBOUR.

These extensive and important works are fast approaching completion, and a considerable step in advance has been made this week by floating four of the new caissons into their places. Keyham lies on the margin of Hamoaze, to the north of the gunwharf, which almost adjoins the dockyard at Devonport. The area of the works is similar to that of the dockyard—about seventy-five acres. The western side faces Hamoaze; on the north is Keyham Lake, and on the south Moon's Cove. It is thus surrounded on three sides by water. The east is bounded by a high wall, which forms one side of the road leading from Devonport to Bull Point, the new Government magazine for gunpowder. The main entrance for ships is to the southward, where the depth is 20 feet at low water average spring tides. The entrance is splayed off on both sides to avoid damage by collision from the strength of the tides, which run occasionally with great force up and down Hamoaze. The foundation of the entrance-lock was laid in 1846, by Lord Auckland; it is 36 feet deep at high-water spring tides. This lock leads into the south basin, which covers seven acres,—being 630 feet long by 560 feet broad. In connection with it, running to the eastward, are three large docks, two of which are 310 feet, and one 380 feet long. The basin, docks, wharf, and other parts are formed of fine wrought granite, from the quarries of Messrs. Freeman, and with the other works are skilfully executed by Messrs. Baker and Son, the eminent contractors.

Two powerful cranes, by Carmichael, of Dundee, stand 40 feet vertical from the coping of the south basin; they can plumb 35 feet, and their power has been tested to the extent of 40 tons. The Lords of the Admiralty propose to place a disabled steam-ship under one of these cranes, for the removal of the steam machinery and all unnecessary lumber, and then pass her into the charge of the master shipwright, who will put her into dock and repair her hull. She will then be sent through the south basin into the north basin, which is intended to be 700 feet long by 450 feet broad; but only two-thirds of it are yet finished. Here she will fall into the hands of the chief engineer, who will complete her machinery and boilers on the east side, and pass her to the north, where the carpenters, riggers, and painters will do their work. She will then be coaled, and will depart by a western communication from Hamoaze. The north basin is provided with a gigantic crane by Fairbairn, of Manchester, which is to be tested to the extent of 60 tons.

Messrs. H. and M. D. Grissel, of the Regent's Canal works, have supplied the Government with five caissons for closing the entrances to the docks, &c. These machines, which seem well adapted for the purpose, are constructed in a peculiar manner, invented by Mr. Scamp, assistant-director of works at Somerset-house. They are shaped something like a vessel, with two bows or stems; but the stems and keel, which are of wood, are perfectly straight, the keel horizontal, the stems inclining a little from the perpendicular. They fit into a groove of granite larger than the timber, the exclusion or retention of the water being obtained by the force with which the wood is set against the smooth and equal surface of the groove. The caissons are

made of iron-plate, half an inch to three-eighths thick; besides the upper deck, they have two water-tight decks, which divide the machine into three compartments; these divisions form the peculiar characteristic of the new caissons. The lower compartment is for the reception only of brick-ballast, sufficient of which is placed in it to sink a caisson, say to a depth of 17 feet, when it would float at discretion. The middle compartment, 7 feet high, is furnished with an inner and an outer sluice, which, when open, do not affect the floatation. The upper compartment is fitted with several tanks, and when these are filled with water from above, the caisson is sent down rapidly into its place. When the water in the dock is higher than that in the basin, the sluice on the dock side is opened, and the other closed, and *vice versâ*. By this arrangement accidents through unexpected buoyancy, which have occurred with some caissons, are avoided. One man can in a very short time float a caisson of the new construction; by turning a wheel a mitre-valve is lifted, all the water runs out of the tanks, and the ponderous machine can be easily removed in any direction.

The buildings at Keyham are progressing. The entrance is near the south-east corner, where a station for 50 policemen and a guardhouse for the military are in an advanced condition. At the head of the docks is a large fire-proof smithery, with lofty granite chimney-shafts at each corner; this building, with the fitting-shops and sheds further on, is complete. The principal erection, the foundation and plinth of which is only laid, will be the quadrangle to the east of the north basin; the quadrangle will contain stores for the engineer, and for the copper, brass, and whitesmiths, and two boiler-houses; the centre will be occupied by the foundry. It is designed to form a boat-basin and boat-house at the extreme north, near Keyham Lake. On the highest ground, near the eastern road, there is a large salt-water reservoir for feeding the caissons, &c.; and near it will be constructed a reservoir for fresh water. The drainage of the works is ingeniously arranged so that water can be thrown from one dock or basin into another, however distant. The engineer-in-chief is Colonel Williams, of the Royal Engineers, and the engineer in charge of the works is Mr. R. Townsend, civil engineer. The buildings are from designs by Mr. Scamp and the department of the Director of Works.

About one million sterling has been expended on Keyham, and it will require some 800,000*l.* to complete the establishment. Large as is this expenditure, the cost is said to be less in proportion than that of other similar establishments. The docks at Keyham cost each about 45,000*l.*, while on one at Sheerness, not so large, 125,000*l.* was spent, owing partly to the difficult foundation. The west dock at Woolwich, which is only 300 feet long, cost 90,000*l.* The new caissons at Keyham cost, on an average, 4,500*l.* each.

Joyce's Scientific Dialogues, with the Corrections and Improvements of the late Dr. Olinthus Gregory: a New and Enlarged Edition, containing the Recent Additions to Science. By CHARLES V. WALKER. Longman and Co.

THE high reputation which "Joyce's Scientific Dialogues" have acquired during a long course of years, as an elementary work for the young, and the eminent service which they have rendered to the cultivation of natural philosophy in this country, entitle them to the editorial revision of the distinguished men whose names appear in the title-page. Since the last edition made its appearance, the domains of science have been widely extended, and new facts have accumulated on our hands in such numbers and in such rapid succession, that as yet there has hardly been leisure to marshal them in the places which they should occupy in the annals of knowledge. Even confining our attention to the more popular or more striking of these, their number and magnitude present a vastly extended field for the industry of the literary pioneer of science. The small but precious volume now introduced to the world affords abundant testimony to this circumstance; as its original pages disclose how much it has been necessary to add to previous editions, to represent fairly, even upon the unassuming scale of teaching which it proceeds upon, the state of each of the physical sciences in our own time. There being but few readers in science who are not acquainted with these Dialogues, as they stand in the older editions, and who have not admired their general elegance and simplicity, and the success with which every principle is explained and illustrated, our present notice need only refer to the additional matter which we now meet with. Mr. Walker has been most happy in conveying recent discoveries in the sciences in the same clear and successful language which obtained for the original work so extensive a popularity. In revising the other portion of it, also, his high appreciation of the merits of the Dialogues, in

point of style and perspicuity, has induced him to be careful not to touch with a rude hand upon their general tenor, which has proved, by long and ample experience, to be attended with such excellent effect in the education of youth. Among the new subjects of which the lapse of time has necessitated the introduction, are the new planet Neptune and the nineteen asteroids, the diving-boat, the locomotive engine, binocular vision, the stereoscope and the pseudoscope, magneto-crystalline action, and the brilliant discoveries of Faraday in electro-magnetism and its associated sciences. These and some other matters form the subject of long and extremely-interesting conversations, in which ample justice is done to each. For the rest we may observe, that some of the more important conversations have been amplified, the tables revised and enlarged, and new ones introduced. Altogether, the book is worth its weight in gold in the formation of the youthful mind; and certainly there is none we are acquainted with better calculated to develope its energies with vigour and effect. As a specimen of the new conversations, we propose to give our readers the following paragraph, describing an elegant application of the reflecting stereoscope, in conjunction with photography:

"The reflecting stereoscope, on account of its properties, and the extent of its capabilities, is becoming an instrument extremely useful to the architect and the engineer. Instead of the expense and the care of making drawings illustrative of the progress of the works, it is now merely necessary to take sun-pictures in the camera, under the necessary angles, and place them in the stereoscope, when the reality of the building in its then state is presented to the eye. This plan is being adopted by Mr. Vignoles, the celebrated engineer, in respect to the wrought-iron bar chain suspension bridge, in course of construction at Kioff over the river Dnieper, by command of the Emperor of Russia. You remember seeing the model of this bridge in the central avenue of the Great Exhibition: it is engraved at p. 314, of the Illustrative Catalogue. The Emperor of Russia is provided with a reflecting stereoscope: the engineer is provided with two first-class cameras, and an experienced manipulator. Week by week he takes sun-pictures of the state of the works, and sends them, in a proper state, with a brief description, to the Emperor. His Imperial Majesty places them in the camera, and with his own eyes sees the actual state of things, and has before him an irresistible reply to all that his courtiers may insinuate against the English engineer."

An Elementary Treatise on the Lunar Theory, with a brief Sketch of the History of the Problem up to the Time of Newton. By Hugh Godfray, B.A., of St. John's College, Cambridge. Cambridge: Macmillan and Co. London: George Bell, &c.

A work of this kind has long been wanted. The lunar theory, as our mathematical readers are well aware, is a subject which requires a considerable amount of knowledge of transcendental mathematics in order to enter upon it. But no student who has once commenced mathematics is likely to leave off without attempting at least to understand this — the most important and interesting of all its applications to physical science. The treatises on the subject, in our own and the French language, are tolerably numerous; but most of them treat the "lunar" theory as a branch of a more general subject; and there are but two or three, we believe, which have treated it separately. Not one of these, however, has placed the subject in so simple and satisfactory a light as it is capable of. The beginner in this, as in so many other things, finds difficulties at almost every step, many of which have been left in his way by unskilful writers. Mr. Godfray—whose name is already known to some of our readers as a contributor to former volumes of the Magazine—has produced just such a book as the student wanted; clearing away several of the obstacles which former writers had left untouched, and presenting the whole subject in a better point of view. We have, therefore, much pleasure in recommending it to all who take any interest in the subject, as the best elementary treatise on it which has yet appeared.

SPECIFICATIONS OF ENGLISH PATENTS ENROLLED DURING THE WEEK ENDING MAY 26, 1853.

William Petrie, of Woolwich, Kent, civil engineer. *For improvements in obtaining and applying electric currents, and in the apparatus employed therein; part or parts of which improvements are applicable to the refining of certain metals, and to the production of metallic solutions, and of certain acids.* Patent dated November 13, 1852.

A further notice of Mr. Petrie's improvements will appear in our next Number.

PROVISIONAL PROTECTIONS.

Dated March 14, 1853.

635. John O'Leary, of Liverpool, Lancaster, mechanic. Improvements in chests for the use of emigrants, whereby they are also made applicable to other purposes.

637. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the application of porcelain and similar materials to ornamenting purposes. A communication.

Dated April 14, 1853.

906. John Wallace Duncan, of Grove-end-road, St. John's Wood, Middlesex, gentleman. Certain new combinations of gutta percha with other materials, and the method of applying such for use.

Dated April 19, 1853.

947. Edward Vivian, of Torquay, Devon, banker. Improvements in cases for containing hats, in churches and similar situations.

Dated April 23, 1853.

977. Frederick Tompkins, of Manchester, Lancaster, silk and satin finisher, waterer, and embosser. Improvements in the mode or method of embossing and finishing woven fabrics, and in the machinery or apparatus employed therein.

Dated April 27, 1853.

1027. Alfred George Anderson and John Barker Anderson, of Great Suffolk-street, Southwark, soap-manufacturers. Improvements in the treatment of certain saponaceous compounds obtained in the manufacture of soap.

Dated April 28, 1853.

1032. Peter Fairbairn, of Leeds, York, machinist, and Ferdinand Kaselowsky, of Berlin, engineer. Improvements in machinery for drawing, roving, and spinning flax, hemp, and other fibrous substances.

Dated May 4, 1853.

1085. Edward Walmsley, of Heaton Norris, Lancaster, spinner. Improved modes of preventing accidents arising from an insufficient supply of water in steam boilers.

1087. Charles Videgrain, of Paris, France. Certain improvements in the treatment and preparation of certain natural or artificial stones, to render them applicable to various useful and ornamental purposes.

1088. Jean Brando Giannetti, of Paris, France. Applying the ascensional force of balloons to various useful purposes.

1089. Thomas Masters, of Oxford-street, Middlesex, confectioner. Improvements in apparatus for freezing, cooling, and churning.

1090. John Houseman Hutchinson, of Grantham, Lincoln, surveyor. Improvements in ventilating-bricks.

1091. Edmund Jury Ockenden the elder, and Edmund Jury Ockenden the younger, of Brighton, Sussex, builders. Improvements in valves and stop-cocks.

1092. James Edgar Cook, of Greenock, Renfrew, booking-clerk. An improved composition for coating and preventing the decay of exposed surfaces.

1093. Jean Baptiste Verdun and Jean Baptiste Mertens, of Rue du Buffauld, Paris, France, gentlemen. Certain improvements in the construction of celestial and terrestrial globes.

1094. John Scott Russell, of Great George-street, Westminster. Improvements in marine steam engines.

1095. Charles Goodyear, of Avenue-road, St. John's Wood, Middlesex. Improvements in combining India-rubber with certain metals.

1096. Thomas Taylor, of Manchester, Lancaster. Improvements in apparatus for measuring and for governing the flow of water and other liquids.

1097. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in apparatus for rolling iron. A communication.

1098. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the treatment of fibrous and other substances, for the purpose of ascertaining the quantity of moisture contained therein. A communication from M. Joseph Louis Rogeat, of Lyons, France.

1099. James Walker, of Bow, Middlesex, civil engineer. Improvements in turn-tables used for railway and other purposes.

Dated May 5, 1853.

1100. William Moore, of Duke-street, Lambeth, Surrey, engineer. Improvements in furnaces.

1101. Joseph Dempsey Holdforth, of Leeds, York, silk-manufacturer. Improvements in machinery for combing or dressing silk and other fibrous substances.

1103. John Rawe, junior, of Lemaile, near Wadebridge, Cornwall. Propelling vessels and other vehicles in the water.

1104. Joel Livsey, of Bury, Lancaster, gentleman. An improvement in looms for weaving.

1105. Jean Conrad Stiffell, of Poultry, City, merchant. Improvements in machinery for crushing auriferous quartz, and amalgamating the gold therefrom. A communication from Mr. H. Berdan, of New York.

1106. Matthias Edward Boura, of Crayford, Kent, India-rubber manufacturer. Improvements in saddlery and harness.

1107. John Whiteley, of Stapleford, Nottingham, lace-manufacturer. Improvements in warp-machinery for producing ornamented and textile fabrics.

1108 John Hetherington, of Manchester, Lancaster, machine-maker. Improvements in preparing cotton, wool, flax, silk, and other fibrous substances for spinning.

1109. Thomas Symes Prideaux, of St. John's Wood, Middlesex. Improvements in propelling vessels.

1110. Thomas Fearnley, of Albion Works, Bradford, York, engineer. Improvements in steam boilers.

Dated May 6, 1853.

1112. Charles William Bell, of Manchester, Lancaster, physician. Improvements in carriage-springs.

1114. George Dowler, of Birmingham, Warwick, manufacturer. Improvements in boxes for containing and igniting matches.

1115. Augustus Brackenbury, of Camden Town, Middlesex, gentleman. Improvements in precipitating the muriate of soda from its solutions in water.

1116. John Ryan Danks and Bernard Peard Walker, of Wolverhampton, Stafford, cut-nail manufacturers. Improvements in machinery or apparatus for the manufacture of nails.

1117. James Egleson Anderson Gwynne, of Essex Wharf, Essex-street, Strand, engineer. Improvements in the treatment or manufacture of peat and other substances to be used as fuel.

1118. John Thomas Stroud, of Birmingham, Warwick. Improvements in the valves of pressure lamps, and in lamp-burners.

1119. George William Jacob, of Dalston, Middlesex. An improved manufacture of metallic covers or seals for bottles, jars, and other like vessels, and in applying or affixing them.

1120. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, London. Certain

improvements in the manufacture of hat-plush. A communication.

1123. Mariano Riera, of Madrid, Spain. Certain improvements in fire-arms.

1124. Francesco Capeccioni, of Castle-street, Holborn, London. Certain improvements in the manufacture of candles.

Dated May 7, 1853.

1125. James Nichol, of Edinburgh, Scotland, bookseller. Improvements in bookbinding.

1126. Christopher Richard Norris Palmer, of Amwell, Hertford, Esq. A new and improved mode of communicating or signalling between the guards and engine-drivers on a railway train, also applicable to other purposes.

1127. John Pullman, of Greek-street, Soho, Middlesex. Improvements in the manufacture of losh, or oil-dressed leather.

1128. Henry Warner, manufacturer, Joseph Haywood, and William Cross, machinists, of Loughborough. Improvements in machinery used in the manufacture of framework-knitting.

1129. Hesketh Hughes, of Cottage-place, City-road, Middlesex, manufacturer, and William Thomas Denham, of the same place, manufacturer. Improvements in machinery for weaving.

1130. William Boggett, of St. Martin's-lane, Westminster, gentleman, and George Brooks Pettit, of Lisle-street, Westminster, gas-engineer. Improvements in apparatus for heating by gas.

1132. Alexander Chaplin, of Glasgow, Lanark, North Britain, engineer. Improvements in the construction of ships and boats.

1133. George England, of Hatcham Iron-works, New Cross, Surrey, engineer. Improvements in screw-jacks.

Dated May 9, 1853.

1135. John Fisher, of Liverpool, Lancaster, engineer. Improvements in machinery for propelling vessels, and in the mode of manufacturing the same.

1136. David Law, of Glasgow, Lanark, North Britain, and John Inglis, of the same place, iron-founders. Improvements in moulding or shaping metals.

1137. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in machinery for combing and preparing wool and other fibrous materials. A communication.

1138. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in coating or plating vessels and other articles for the better resistance of the action of acids and salts. A communication.

1139. Peter Wright, of Dudley, Worcester, vice and anvil-manufacturer. Improvements in the construction or manufacture of tew-irons.

1140. Thomas Quaife, of Battle, Sussex, watchmaker. Improvements in the manufacture of watches, watch-cases, and in tools and apparatus employed therein.

Dated May 10, 1853.

1142. James Brown, of Bridge-terrace, Canal-road, Stepney, Middlesex, machinist. An improvement in anchors.

1143. John Clapham, Thomas Clapham, and William Clapham, of Wellington Foundry, Keighley, York. Improvements in moulding and casting iron pipes.

1144. Thomas Murray, of Marygold, Berwick, Scotland, farmer. Certain improvements in breaks or drags for wheeled carriages, and in adapting the carriages for the application and use of such breaks.

1145. Gregory Kane, of Dublin, camp-furniture manufacturer. The construction of portable houses or portions thereof, out of parts, which may be used for other purposes.

1146. Octavius Henry Smith, of Bedford-square, and Youngs Parfrey, of Pimlico, Middlesex. Improvements in the manufacture of carriage-wheels.

1147. Robert Brown, of Waterloo-road, Liverpool, Lancaster. Improvements in lifting and forcing water and other fluids.

1148. George Tillett, of Kentish Town, Middlesex. Improvements in the manufacture of metal bedsteads.

1149. George Roberton and Alexander Roberton, stuff-finishers, of Bradford, York. Improvements in apparatus for drying and finishing woven fabrics.

1150. William Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in machinery or apparatus for sewing. A communication from William Wickersham, of Lowell, Massachusetts, United States.

1152. Alexander Chaplin, of Glasgow, Lanark, North Britain, engineer. Improvements in apparatus for the transmission of aëriform bodies.

1153. George Stevenson Buchanan, of Glasgow, Lanark, North Britain, finisher. Improvements in the treatment or finishing of textile fabrics.

Dated May 11, 1853.

1154. Samuel Russell, of Sheffield, York, manufacturer. Improvements in handles for razors.

1156. Marie Pierre Ferdinand Masier (doctor), of Aigle, France. A machine for cutting and reaping corn, corn-crops, and other plants.

1158. John Crabtree, of Heywood, Lancaster, and Thomas Livsey Scott, of Heywood aforesaid, engineer. Certain improvements in machinery for preparing and spinning cotton and other fibrous substances.

1160. Richard Edmondson, of Blackburn, Lancaster, manufacturer. Certain improvements in the manufacture of covered corded textile fabrics, and in machinery to be used for that purpose, being applicable either to hand or power.

1162. Thomas Powditch Jordeson, of Lewisham-road, New Cross, Kent, commission agent. Certain improvements in rafting timber and other goods.

1164. William Bradbury and Frederick Mullett Evans, of Whitefriars. Improvements in taking impressions and producing printing surfaces. A communication.

1166. Julien François Belleville, manufacturer, of Paris. Improvements in propelling.

1168. John Lee Stevens, of King William-street, London, civil engineer. An improved fastener for flowers and shrubs.

Dated May 12, 1853.

1172. George Frederick Goble, of Fish-street-hill, London, master mariner. Improvements in propelling vessels and carriages, parts of the machinery therein employed being also applicable to other like purposes.

1174. Martin Walter O'Byrne, and John Dowling, of Raquet-court, Fleet-street, Middlesex, engineers. Improvements in the manufacture of mangles.

1176. Joseph Sawtell, of Newport, Monmouth. Improvements in economizing fuel, by rendering available the heat from coke ovens, and applying the same to the heating of air-kilns, stoves, ovens, and to the generation of steam.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 20th, 1853.*)

1042. Jules Lejeune. A new machine for washing house-linen, and all kinds of textile articles that are employed in making them.

1158. William Russell. Improvements in boilers for generating steam and hot air, together or separately.

1165. William Tuer, William Hodgson, and Robert Hall. Improvements in the manufacture of textile fabrics, and in machinery or apparatus for weaving, part of which is also applicable to machinery for preparing textile materials.

(*From the "London Gazette," May 24th, 1853.*)

1173. James Darling and Henry Spencer. Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

1174. William Beckett Johnson. Improvements in steam boilers, and in apparatus connected therewith.

1175. Pierre François Giraud. An apparatus for the interior of bonnets to fix them on the head.

1177. Edward Mucklow. Certain improvements in the construction of retorts for the manufacture of pyroligneous acid, or for other purposes of destructive distillation.

1178. Edward Mucklow. Certain improvements in machinery or apparatus for cutting or rasping dye woods.

16. Edward Clarence Shepard. Improvements in the manufacture of gas.

42. William Sykes Ward. A thermostat, or apparatus for the regulation of temperature and of ventilation.

43. William Watson the younger. Improvements in apparatus for the manufacturing of prussiate of potash.

55. John Abraham. A new or improved method of manufacturing percussion caps.

81. William Bryer Nation and Joseph Dyer. An improvement or improvements in the manufacture of soap.

120. John Thornborrow Manifold and Charles Spencer Lowndes. Improvements in steam engines.

215. Joseph Scott. Improvements in closing or stoppering bottles, jars, and other receptacles.

225. William Archer. An improved mode or modes of preventing accidents by improved signals on railways, parts of which improvements are applicable to blast furnaces.

335. Auguste Edouard Loradoux Bellford. Improvements in the treatment of bituminous and asphaltic matters, rendering them applicable to various useful purposes. A communication.

431. Antonio Fedele Cossus. Improvements in filters.

541. John Wright. Improvements in machinery for manufacturing bags or envelopes of paper, calico, or textile fabrics.

694. John Barsham. Improvements in apparatus for communicating between the guard and engine-driver, or other persons in a railway train.

748. Robert Heath. Improvements in railway-breaks and signals.

812. George Purcell. A new method of adjustment in the art of printing by means of certain combinations of various-sized spaces and quadrats.

936. John Wallace Duncan. Certain new combinations of gutta percha with other materials, and the method of applying such for use.

957. Sir William Snow Harris. Improvements in lightning-conductors for ships and vessels.

999. Archibald Slate. An improved filter for water and other liquids.

1027. Alfred George Anderson and John Barker Anderson. Improvements in the treatment of certain saponaceous compounds obtained in the manufacture of soap.

1048. John Kealy. Improvements in machinery for mowing.

1072. George Thomas Holmes. Improvements in thrashing-machines and apparatus connected therewith for shaking the straw, riddling, winnowing, and dressing the corn.

1073. Robert Walter Swinburne. Improvements in the manufacture of glass.

1081. William Edward Newton. Improvements in hot-air furnaces for heating buildings, some of which improvements are applicable to other furnaces. A communication.

1083. William Edward Newton. Improved machinery or apparatus for dressing mill-stones. A communication.

1084. George Bell. A new machine for several agricultural purposes.

1091. Edmund Jury Ockenden the elder, and Edmund Jury Ockenden the younger. Improvements in valves and stop-cocks.

1094. John Scott Russell. Improvements in marine steam engines.

1095. Charles Goodyear. Improvements in combining India-rubber with certain metals.

1101. Joseph Dempsey Holdforth. Improvements in machinery for combing or dressing silk and other fibrous substances.

1102. Charles Larbaud. A new system of trigger applied to play-arms, such as pistols, fusils, rifles, cannons, guns.

1103. John Rawe, jun. Propelling vessels and other vehicles on the water.

1109. Thomas Symes Prideaux. Improvements in propelling vessels.

1114. George Dowler. Improvements in boxes for containing and igniting matches.

1115. Augustus Brackenbury. Improvements in precipitating the muriate of soda from its solutions in water.

1119. George William Jacob. An improved manufacture of metallic covers or seals for bottles, jars, and other like vessels, and in applying or affixing them.

1125. James Nichol. Improvements in book-binding.

1127. John Pullman. Improvements in the manufacture of losh, or oil-dressed leather.

1128. Henry Warner, Joseph Haywood, and William Cross. Improvements in machinery used in the manufacture of framework knitting.

1140. Thomas Quaife. Improvements in the manufacture of watches, watch-cases, and in tools and apparatus employed therein.

1146. Octavius Henry Smith. Improvements in the manufacture of carriage-wheels.

1148. George Tillett. Improvements in the manufacture of metal bedsteads.

1149. George Roberton and Alexander Roberton. Improvements in apparatus for drying and finishing woven fabrics.

1162. Thomas Powditch Jordeson. Certain improvements in rafting timber and other goods.

1164. William Bradbury and Frederick Mullett Evans. Improvements in taking impressions and producing printing surfaces. A communication.

1213. George Berry. An improved method of roasting coffee, cocoa, and chicory.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1213. George Berry, of Buttesland-street, St. Leonard's, Shoreditch, gentleman. An improved method of roasting coffee, cocoa, and chicory. May 17.

WEEKLY LIST OF PATENTS.

Sealed May 20, 1853.

1852:

813. John Weems.
823. Auguste Edouard Loradoux Bellford.
831. William Edward Newton.
836. William Oldham.
837. Augustus Turk Forder.
838. James Carter.
840. John Gedge.
924. William Slater.
974. Edward Tucker.
984. Thomas Challinor.
1095. John Filmore Kingston.
1194. James Edgar Cook.

1853:

288. Richard Archibald Brooman.
418. Thomas Clark Ogden and William Gibson.
596. François Valtat and François Marie Rouillé.
650. John Vanden Hielakker.
678. George Mackay.
711. Antoine François Jean Claudet.
818. William Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
May 20	3462	J. W. and T. Allen	Strand	Writing-desk.
21	3463	G. Burt	Birmingham	Tallow-lamp.
23	3464	W. Battley and J. Rivett	Northampton	Clover-rubber.
25	3465	T. Ottewill	Barnsbury	Camera.
26	3466	G. Turner and T. Mitchell	Bradford	Spring-machine fly-assister.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

May 20	513	J. G. Reynolds	City-road	Arca proteos.
23	514	C. De Bergue	Dowgate-hill	Railway-bar.
,,	515	C. De Bergue	Dowgate-hill	Railway-fastener.

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DRAY'S PATENT CRUSHER AND PULVERIZER.

Fig. 1.

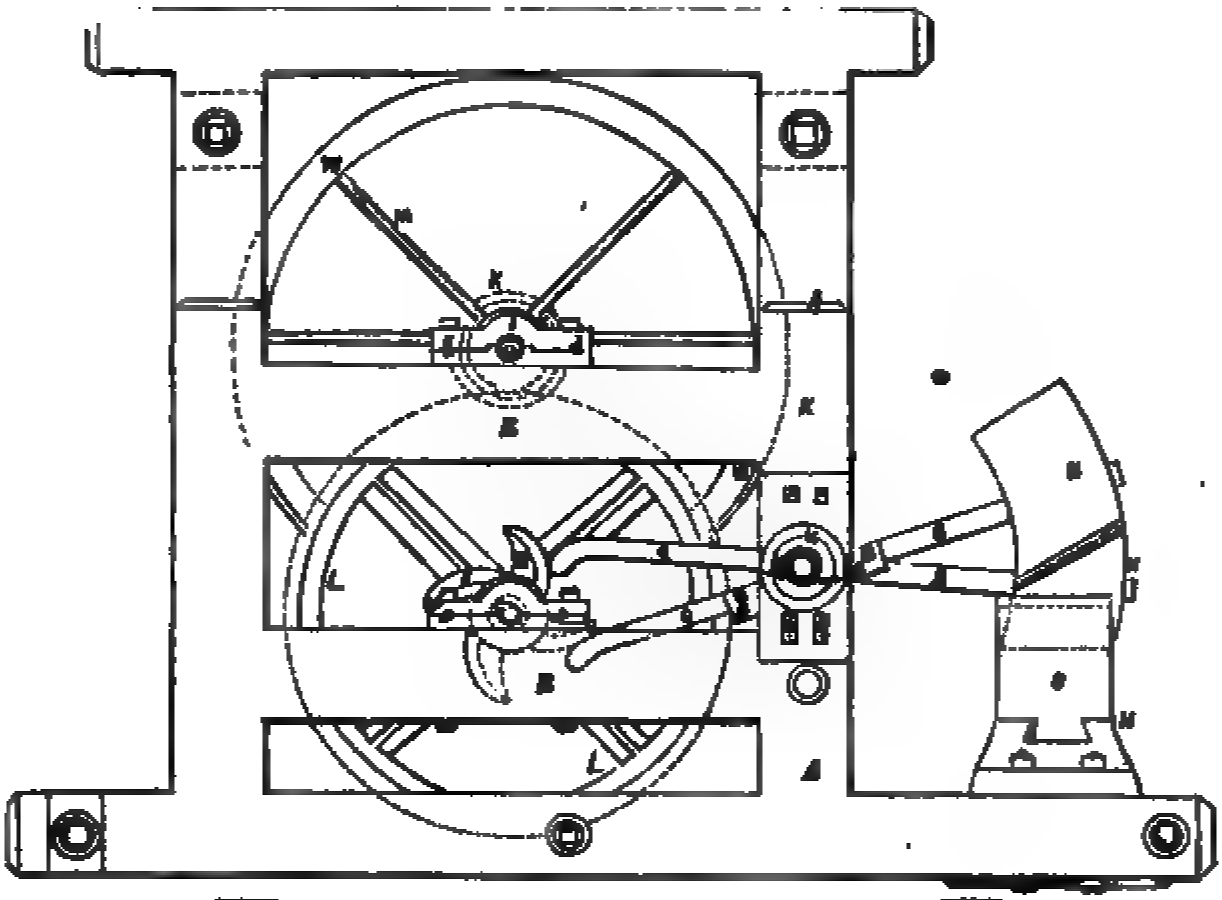
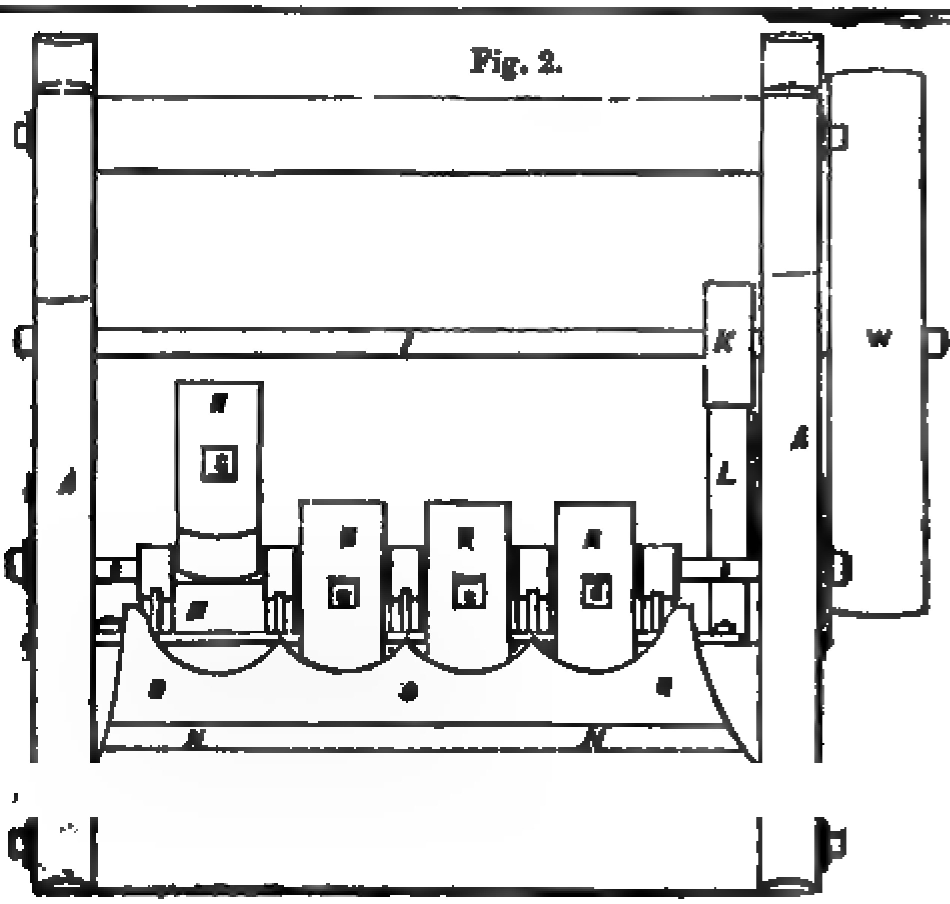


Fig. 2.



DRAY'S PATENT CRUSHER AND PULVERIZER.

(Patent dated November 20, 1852.)

THE machinery described in this patent, and the construction of which is exhibited in the figures on the front page of this number, is intended for crushing, bruising, and pulverizing ores, bones, gorse, and other hard substances requiring reduction in large quantities. It will be seen, on a glance at the figures, that the principle of the apparatus patented by Mr. Dray consists in adapting one or more hammers, constructed and worked in a manner similar to the ordinary tilt-hammers. Fig. 1 is a side elevation, and fig. 2 a front elevation of a machine constructed according to this patent. A A are four pillows or standards, connected by the headstocks, B B. C is a shaft which turns in the plummer-blocks, D D, bolted on the head stock, B. E E are a series of cams which are keyed upon the shaft, C. F is a second rod, or shaft, fixed in brackets in the uprights, A A. G G are a series of levers bolted between the flanges, *a a*, which have eyes upon their underside, so as to be capable of adjustment upon the shaft, F. H H are heavy blocks or hammers which are keyed upon one end of the levers, G. The other ends of the levers are slightly bent down as represented, and are acted upon alternately by the cams, E. I is a shaft turning in the brasses, *d d*, on the head stocks, B B, and having keyed upon it the spur-pinion, K, which gears into the spur-wheel, L, on the cam-shaft, C, and serves to impart motion to the cams, upon turning the crank-handle, M. W is a fly-wheel. Instead of driving this machine by hand, fast and loose pulleys may be mounted on the shaft, C, and driven from a steam engine, when a large quantity of heavy work is to be performed. N is a block upon which the anvil, O, is laid.

The operation of the machine is as follows:—The materials to be crushed, or pulverized, are placed upon the anvil, O, and the machine set to work, which causes the cams, as the shaft, C, revolves, to raise or tilt the hammers, H, and make them fall upon the materials, and so crush and pulverize them. The face of the hammer is slightly rounded, and the anvil is made concave to correspond with it in figure. For crushing bones and other animal or vegetable matters, the face of the hammers, H, are serrated, or fluted, and the anvils are serrated to correspond. One face of the hammer being made smooth, and the other fluted, they are capable of being turned to adapt them to the various kinds of materials to be operated upon, the anvils also being so made as to be capable of being turned to suit that arrangement.

PETRIE'S PATENT GOLD-REFINING PROCESS.

TAKING up Mr. Petrie's process at the point where we left it in our last Number but one, the remaining steps are conducted in the following manner:

The saturated solution of nitrate of silver, just so far diluted with water as to prevent crystallisation, next passes, from the solution-cells first described, into shallow rectangular flat-bottomed pans, or troughs, of stoneware or of wood, lined with gutta percha, ranged side by side, but in a gradient series, each being a little below the one behind it, so that the solution overflows, by lips, from one trough to the others in succession. These troughs constitute the external portion of the "gradient battery." Across each of them are placed, at about eight inches apart, small troughs of porous wedgwood ware, of the thinnest substance, but not of such coarse material as to admit of any appreciable percolation. Their ends rest on the edges of the larger external troughs, and their under-sides belly down into the solution. These porous troughs, like the external troughs, overflow from one to another through the series, by lips resting either over the sides of the external troughs, or lying within sets of the overflow lips in those sides. In the porous troughs are placed lips of thick sheet zinc, previously washed in a dilute solution of hydrochlorate of mercury. Very dilute sulphuric acid, of the brownest and commonest description, is made to drop continuously through this series of porous troughs, and the proper electric connection being made between the zinc and a prepared surface in the flat bottoms of the external troughs, the electric current passes through it, and precipitation of the metallic silver gradually takes place; not like a finely divided powder requiring further preparation, as in the refiner's ordinary process, but in the form of a solid sheet, with a crystalline surface. These sheets of silver may be removed from the troughs whenever they have acquired the desired thickness, and the silver is deposited, in various grades of purity, in the different troughs. The free nitric acid, with a small quantity of nitrate of silver still in solution, flows off at the end of the

series, and is passed back to work over again through the solution-cells in repeated succession. If desired, almost the whole of the silver may be separated from the nitric acid before it leaves the battery, and some novel arrangements are described for effecting this in the most perfect manner. Practically, however, it is anticipated that this will not be required. The porous troughs are glazed above the liquor, and also on some parts below the liquor, which prevents the efflorescence of the salts upon them, and the undue intermixture of the zinc solution with that of the silver. This intermixture is also checked by the quality of the porous material, and by the form of the vessels reducing the difference of hydrostatic pressures to a minimum. If it were attempted to use ordinary kinds of galvanic arrangements for this precipitation, the intermixture of the liquors would be sufficiently great to constitute a serious, if not a fatal obstacle; and several other difficulties (for instance, the tendency of the nitric acid to re-dissolve some parts of the precipitated silver, its disposition to unevenness of growth, and to ramification, the tendency of the electric current to cause the decomposition of the nitric acid itself, as well as of its silver salt, and the practical difficulties of manipulating with galvanic apparatus on a large scale, and kept in continuous action) which present themselves in this application of any existing galvanic apparatus, have been met by arrangements detailed in the specification.

At intervals the nitric acid, after performing repeated rounds through the solution-cells and battery before described, becomes too much charged with baser metals to continue to act effectively. In such cases it is passed through a spare battery suited to the purpose, and there it is made to deposit most of its metals in more or less purity along with some of the silver, and this occasional metallic deposit is treated by the known processes to separate the silver and copper. The zinc used in the above process is only about 40 per cent. of the weight of the silver recovered, and is regained in the form of sulphate of zinc, which, being between four and five times the weight of the zinc consumed, is, when prepared for the market, more than equal to the value of the original zinc.

Many modifications of the galvanic apparatus are specified, most of which are also applicable to a variety of other useful purposes in the electric arts. Several new kinds of magneto-electric machines are also described, differing greatly from those at present in use, whereby the electric power to precipitate the silver (as in the art of electro-plating, but in a modified manner, and much more abundantly) may be developed by mere mechanical force instead of using the porous troughs, the supply of zinc, &c., already described. Mr. Petrie believes that improvements similar to the foregoing may be applied to certain parts of another gold-refining process, in which oil of vitriol is the chief menstruum.

From the above abstract of this important specification it will be seen that the refining is thus made to be a continuous process; and that, viewing the apparatus as a whole, the nitric acid runs in at the upper end of the arrangement, separates the silver from the gold more thoroughly, and with the use of less acid, than by the old process, at the same time without dispersing its corrosive fumes. It appears also that the solution as it flows onwards, deposits the silver by itself, and the original nitric acid emerges from the lower end of the apparatus and of the oxydator, ready to pass back continuously, and thus renew its circuit and turn out more refined gold in constant succession.

The chief obstacle which, doubtless, has hitherto discouraged inventors from attempting the application of one part of this invention to gold-refining, viz., electric precipitation, has been the great amount of manipulation and trouble necessary to keep in continuous working order the requisite extent of galvanic apparatus. This seems to have been fully appreciated by the inventor, who, as we know, has devoted himself for the last fourteen years to the practical working of extensive galvanic and magnetic arrangements, with a view to the economic use of electricity for illumination and various other purposes in the arts. In the present case, the obstacles alluded to having apparently engaged a large share of his attention, we may hope that the arrangements now patented will reduce the expenses of manipulatory labour to a comparatively small item. While we may reasonably expect these results on the one hand, the chief practical advantages of his process consist, on the other, in saving nearly the whole expense of the nitric acid, and the expense of the copper used in the ordinary mode of refining; in the parting being effected by a single operation; and in obtaining the gold in a more perfectly pure and less disintegrated state; in recovering the silver in a more solid and convenient form, and in the absence of the nuisance, as well as the waste, of the nitrous fumes. These circumstances, we doubt not, will procure for Mr. Petrie's ingenious and eminently philosophical patent a large measure of success.

APPLICATION OF THE PENDULUM TO THE DETERMINATION OF VELOCITIES.

(Translated, for the *Mechanics' Magazine*, from M. De Boucheporn's paper, read before the French Academy of Sciences.)

THE invaluable instrument which we call a pendulum has been applied to an infinity of objects, and always with characteristic advantages in point of precision or sensibility. It was only recently that by a new application of it, the most lofty in its object, and the most ingenious in its nature, it was made to render visible the rotation of the globe. Perhaps it was in reflecting on this elegant experiment that I have been led to the thought of another kind of application which, without participating in the same elevated character, recommends itself by having in view an end of real utility, that end having reference to the determination of velocities. And although I may not as yet be in a condition to confer upon this new employment of the pendulum the seal of practical trial, as, nevertheless, the principle of it seems to me sufficiently demonstrated by experiment, I ask that the Academy will permit me to make it acquainted with its nature in a few words, in order, in the first place, to draw its attention to a view which appears to me new, and, in the second place, in order to protect our priority during the course of experiments and of researches, which may possibly have rather a long duration.

The question with which we are dealing is, the application of the pendulum to the measure of the real velocity of vehicles; that is, their velocity referred to the centre of the earth. In everything that concerns navigation, the importance of such an object will be immediately perceived. There exist, indeed, several precise and convenient means of measuring the speed of trains on railways,—for example, where the point of support between the wheel and the rail remains fixed (as distinguished from slipping), it is sufficient to be able to assign the rapidity of rotation of the wheels. But at sea the case is very different. The sea is subject to currents, of which the extent, the direction, and the velocity are never but imperfectly known. The sustaining point is thus itself transported in one direction or the other, and the log, the only elementary and non-astronomical means of measuring the speed of ships, gives, under any circumstances, only the difference between it and that of the surface of the water. On the contrary, it is possible to ascertain the real speed of the vessel by the indications of the pendulum, of which I am about to endeavour to explain the principle.

Suppose that a pendulum beating, say half-seconds, and carrying a bob weighing a few grammes (a gramme is equal to 15·44579 grains Troy), be suspended in such a manner that its plane of oscillation may be parallel to the axis of progression of the vehicle. If the pendulum be vertical, the bob and the point of suspension being subjected to the same velocity, it would remain in the same state for an indefinite period, making abstraction of irregularities of motion, and derangements of various kinds. But if, by a small impulsion given by the hand in a direction contrary to that of the motion of the vehicle, the bob be made to recede a little from the vertical, the velocity of the point of suspension then produces upon it a tractive force through the instrumentality of the rod, which has become inclined to the horizon. That traction has a horizontal component, and ought, consequently, to draw forward the centre of the little mass, with a force proportionate in its intensity to the speed of the vehicle. In falling back again, and after having retrogressed a little behind the vertical, as soon as the obliquity of the rod has become sufficient, the same traction will exert itself anew, and the bob will recommence the same oscillation forwards, under the influence of the two forces of traction and gravity. Without knowing precisely the law of these two combined actions, we may nevertheless conjecture that the pendulum, under these circumstances, would take a deviation forwards, great or small in proportion to the velocity of traction, and remaining sensibly constant if the same speed were maintained. An experimental graduation might then teach how, for a pendulum of given length and weight, to measure the speed of the vehicle on which it was carried, by observing its deviation in front of the vertical.

Such is the principle on which I have reflected, and which I have desired to subject to experiment, to recognise, in the first place, its reality, and then the possibility and the sensibility of a measure so contrived. Moreover, it is very easy to obtain this verification by an experiment to some extent manual,—I not having been able, as yet, notwithstanding several attempts, to construct an apparatus capable of going by itself continuously, and destroying the effect of the various kinds of derangements and irregularities which the hand can extinguish. I do not attempt in this place, therefore, to give an exact measure of the phenomenon, but only to prove the principle of it by an experiment easily reproduced, and which, from being deprived of elegance, is not in substance less decisive.

If we get into a railway-carriage, and

resting our arm against a vertical support, hold a pendulum suspended in connection with the graduated arc of a circle, in conformity with the conditions indicated above, and if, with a proper amount of attention, we preserve this instrument as much as possible from the effect of lateral shocks and vertical movements, we may observe the following result:—We shall hardly have given to the bob a slight retrograde impulse, than, under the influence of traction, we shall see it almost immediately spring forwards through an angle which, for an ordinary speed of 28 miles an hour (10 *lieues*), will soon increase to about 33 degrees. In falling back, on the contrary, the backward deviation is hardly 5 or 6 degrees, and the same motion continuing so long as the velocity lasts, there is thus a very considerable and permanent inequality between the two branches of the oscillation. This is, in some degree, the characteristic part of the phenomenon. If, in this state of things, the velocity of traction should diminish, the direct deviation diminishes nearly as rapidly; and I have never failed, in experimenting in this manner, to become aware of my approach to a station, without taking my eyes off my pendulum.

The inequality between the two branches of the oscillation is also sensible for inferior velocities, and for less than 28 miles an hour, and we still see the pendulum advance 10 degrees before the vertical. The rate of ships being ordinarily comprised between 6 and 18 miles per hour (2 and 3 *lieues*), the variations of amplitude corresponding to such velocities have a very appreciable sensibility. That sensibility besides is susceptible of augmentation, by varying the length or the weight of the pendulum. I am not able at present, however, to say anything certain on the subject. It is clear that there must be certain dimensions which will belong to the maximum of effect; but as to that, experiment does not always bear out suppositions of a complicated and difficult nature, and it is experiment that will have to pronounce.

If we wish to arrive at true precision in the kind of measure of which I have been speaking, the great and real difficulty lies evidently in the construction of apparatus capable of protecting the point of suspension of the pendulum, whether from jerkings and shocks on a railroad, or, above all, from the pitching and rolling of a ship. It is upon this point that my researches are being directed. Already I have made some attempts, and it was to try to combine these several dispositions that I seek to improve our prospects, as regards time, by this communication. Perhaps it never will be possible to obtain an apparatus of continuous action, nor an apparatus capable of working independently of the manual address of the operator. But many very useful instruments are precisely in the same condition; and with regard to continuity, it will be sufficient for me to call to mind, that in ships in motion it is only customary to throw the log three or four times a day. If, however, we should only succeed in affording the means of measuring speed in calm weather, in an intermittent manner, and even under conditions essentially manual, but with a light instrument, of elementary simplicity, easy to construct and to repair, I think we shall have attained an end of unquestionable utility, and it is the hope of that result that attaches me to the prosecution of this research.

Brilliant Aurora.—Mr. E. Lowe, of the Highfield House Observatory, observed a brilliant display of aurora borealis at that spot on the night of Wednesday, the 25th instant, of which he gives the following account:—"The weather for some days past had been very fine, with north-east wind and an almost cloudless sky. The sun last evening, as it set, was of a deep carmine colour, and a red haze surrounded the horizon; this haze remained all night. From 11h. 20m. p.m. till 1h. 22m. a.m. the moon was attended by two mock moons, very elongated and bright (they were formed in cirrous haze), on the horizontal level of the moon, and at a distance of 23° 30′ on either side. From 11h. 25m. p.m. until 1h. 30m. a.m., auroral streamers were almost constant between the limits λ Andromedæ and Cor. Caroli; they seldom extended beyond the altitude of Polaris, commencing at a low auroral arch, whose upper edge passed through α Andromedæ. This arch was of an orange colour, while the streamers were colourless. All the streamers moved easterly (during a similar phenomenon on the 21st of February, 1852, they all moved westerly). The following are the principal streamers:—11h. 25m., through γ Cassiopeia; 11h. 36m., many through Ursa Major and Cassiopeia; 11h. 55m., slightly west of Polaris; 12h. 57m., at maximum brightness, the whole northern horizon between the limits above named filled with streamers rising to an altitude of 53°, the most brilliant through ϵ Cássiopeia and ψ and χ Ursæ Majoris; 1h. 5m., through γ Cassiopeia and β Ursæ Majoris; 1h. 15m., near α Ursæ Majoris. During the whole time there was a patch of orange light in Leo. The cirri clouds in the south-east flickered considerably. Readings of the instruments at 10 p.m.:—Barometer (corrected and re-

duced to 32° F.) 29·846 inches; temperature, 50°; moist temperature, 46·4°; maximum temperature, 70°; evaporation, 0·385 inches; brisk breeze from the north-east. To-day wind east, hot, rapidly falling barometer, and a few cirri and cumuli.

THE PORTPATRICK AND DONAGHADEE SUBMARINE TELEGRAPH.

This important line of communication has at length been successfully effected by a submarine cable, manufactured by Messrs. Newall and Co., of Gateshead, and laid down by that firm on Monday week between Donaghadee and Portpatrick. The cable consists of six communicating wires, insulated in gutta percha, and protected in the usual manner by an outer covering of iron wire. It could not be laid, as was intended, during the previous week, owing to the gales from the East preventing the opening of the dock gates at Sunderland to let the vessel containing it pass out. As several previous attempts to lay a submarine telegraph across the Irish Channel had failed, every care was taken to insure the successful termination of the present attempt, and the expedition, consisting of the screw-steamer *William Hutt* (with the cable and apparatus on board), the *Conquerer*, and the *Wizard*, left the Irish coast, having landed the end of the cable at a point about two miles to the south of Donaghadee harbour, and commenced the submersion of the cable. This operation was performed under the guidance of Captain Hawes, R.N., especially appointed by the Admiralty, who rendered great assistance in determining and directing the exact course to be pursued, without which, in all probability, the squadron could not have successfully overcome the swift tides and adverse currents prevalent throughout in this part of the Channel. The party who accompanied the laying of the cable included, Messrs. Newall, the contractors; Mr. Statham, of the Gutta Percha Works; Mr. Bright, the Secretary; Mr. Charles Bright, the engineer of the English and Irish Magnetic Telegraph Company; Mr. Reid, the telegraph engineer; and Mr. Moseley. The cable was landed on Wednesday morning, in a sandy bay (called Mora-bay), a little to the north of Portpatrick, which belongs to Mr. Blair, of Dunskey, who kindly accorded permission for the laying of the landwires through his estate; and as soon as the end had been taken up to the position assigned, the instruments were put in operation, and the following message was dispatched:—

"Mora-bay, Portpatrick, Monday, May 23.

"The directors of the English and Irish Magnetic Telegraph Company beg to acquaint his Excellency the Lord Lieutenant that they have this morning successfully effected communication between the shores of Great Britain and Ireland, by means of a submarine cable from Portpatrick to Donaghadee."

The cable at each side was then buried in the trenches prepared for its reception, and instruments connected to serve as a means of communication for a short time, until the subterranean line of six wires now being carried from the company's station at Carlisle, through Dumfries, to meet the cable at Portpatrick, is completed to that spot; and an underground line is about to be extended from the Irish end of the cable at Donaghadee to Newtownnards, the terminal station of the County Down Railway, along which the wires of the English and Irish Magnetic Telegraph Company are nearly completed to Belfast. At Belfast the wires meet the company's line of telegraph already completed over the Ulster Railway, and will be carried, via the Belfast Junction and Dublin and Drogheda Railways, into the company's offices on College-green, Dublin, where their line from Galway (already working) and their southern line of telegraph, now in forward course of construction from Cork, will concentrate. The lines of the English and Irish Magnetic Telegraph Company now working between Liverpool, Manchester, Blackburn, Bolton, and Preston, and between Carlisle, Glasgow, Greenock, and Edinburgh, and those now in forward progress between London and Manchester (consisting of the subterranean wires), and between Preston and Carlisle, will join on at Carlisle, and the three capitals and chief towns of England, Scotland, and Ireland, will be thus brought into instantaneous communication with one another.

LAUNCH OF THE "HIMALAYA."

The splendid screw steamship *Himalaya*, designed and built for the Peninsular and Oriental Company, under the inspection of Mr. F. Waterman, jun., at Mr. C. J. Mare and Co.'s establishment at Blackwall, was launched on Tuesday week last in the presence of a large number of spectators, which included the Directors of the Company and several of the nobility. The ceremony of christening the vessel was performed by Lady Matheson, wife of Sir James Matheson, chairman of the Peninsular and Oriental Company; and at half-past two o'clock (shortly before high water) the vessel glided into the water amid the cheers of the numerous spectators.

By an excellent arrangement of ropes attached to the eastern bank of the creek, which were made of sufficient strength to turn her a little to the eastward at the moment of the launch and then break, the launch was most satisfactorily effected.

The *Himalaya* was commenced in November, 1851, and her length between perpendiculars is 340 feet; breadth 46 feet 2 inches; depth of hold, 34 feet 9 inches; and she is of 3,550 tons' burden, with engines of 700 horse power, by John Penn and Son. She was originally intended to have paddle-wheels, with engines of 1,200 horse power, but subsequently, and before she was too far advanced, it was decided that she should be fitted with a screw propeller and engines of 700 horse power on the most approved principle.

Her accommodation will be for 400 cabin passengers, carrying 500 tons measurement goods, and 1,200 tons of fuel. She is admirably protected from risk at sea, having been fitted with six water-tight bulkheads, and is to have an entire outfit of Trotman's improved Porter's anchors,—the excellency of which, as regards safety, strength, and holding powers, has been proved in numerous instances on board the Peninsular and Oriental Company's extensive fleet, and affirmed by the Committee's report on anchors of all nations to possess 124 per cent. superiority over the established anchor for the navy in the above respects. Her bower-anchors will only be 48 and 50 cwt., instead of ordinary anchors weighing 5 tons each, and a saving equal to the great difference in these weights on the bows, or, as it may be termed, at the extreme end of the lever, will be effected; which is an object of great importance to a ship built on fine lines for speed, especially when contending against a head sea.

TRIAL OF MARSTON'S BREECH-LOADING AND SELF-CLEANING RIFLES AT LORD RANELAGH'S.

A HIGHLY interesting examination of this now celebrated invention took place on Wednesday, June 1st, at the country residence of Lord Ranelagh, near Putney, in the presence of a great number of noblemen and scientific gentlemen, amongst whom we observed Lord Lonsdale, Lord Stafford, Lord Churchill, Captain Bean, Mr. Judkins, and Mr. True of America, Mr. Furlong of Dublin, Mr. P. E. Barnes of London, Lieutenant Waler, R.A., &c., &c.

On former occasions, while noticing the wonderful results obtained with these extremely simple and effective weapons, we gave an account of their construction; and in No. 1538 will be found a detailed description of it, with figures. We may now explain briefly, for the convenience of our readers, that in this breech-loading arrangement the cartridge, containing charge, shot, and wad, is deposited in a chamber at the butt, and thrust forward into the barrel of the piece by working a lever, which terminates inside with a breech-bolt in contact with the cartridge, and outside in a curved figure which forms the trigger-guard when the piece is ready for discharging. The priming fire passes through a perforation in the breech-bolt, and explodes the charge. The wad remains behind, but is expelled at the next discharge, clearing out the barrel as it passes. After some thousands of discharges, the bore of the piece remains perfectly clean; and the only use of the ramrod is, if desired, to drive the cartridge back into the recess when it is unnecessary to fire it.

The experiments were conducted under the superintendence of Mr. John Trainor Moulton, who was the first to appreciate the advantages of this contrivance, and has made wonderful progress, both in this country and in France, in bringing them to the knowledge of the military authorities.

The specimens of this fire-arm which Mr. Moulton selected for the trial were a rifle, a duck-gun for shot, and a pistol. The range was 100 yards, and at that distance the admirable precision with which nearly every shot told on the target was highly satisfactory to the noblemen and gentlemen present, nearly all of whom made a trial of the arm.

The chief feature in this weapon, as already suggested, consists in placing a prepared cartridge in the chamber at the breech, and by a very simple lever-power, which forms the trigger-guard, the charge is instantly forced home into the barrel. In the axis of the wad is a small hole, and by means of a common percussion-cap the cartridge is discharged with the utmost certainty by the fire entering through this hole. As each successive shot was fired at the trial, the wad left behind it at the previous discharge was found to be forced out, and in its exit the barrel was perfectly cleaned. Thus, at the conclusion of the practice, the arms were as clean as when they were taken out of their cases; although no less than 200 rounds were fired.

To test the value of these cartridges, a number were left soaking in water for upwards of an hour, and notwithstanding this severe test of their efficiency, especially for marine service, not one of them missed fire. Mr. Moulton, in order to show the rapidity with which he could load and fire with

these arms, discharged the rifle ten times in one minute; and so rapid is the operation of loading, it is a curious fact that the relative proportion of the times for loading and priming is inverted, and that the time occupied in placing the cap on the nipple is nearly double that of loading.

This weapon was deemed by the noblemen and gentlemen present a superior military arm, and one that should be adopted by all governments that mean to maintain their military ascendancy among the armed powers of the world, while for independent rifle clubs, and the militia, it would be almost invaluable, as it would simplify the present mode of exercise.

The party partook of an elegant lunch which the noble Lord had provided, and separated at half-past four, expressing themselves much pleased with the experiments.

Mr. Moulton is about to make these excellent guns on a large scale at Manchester; and he has fixed upon that place for the seat of the manufacture; because, the details being so simple, they require machinists rather than gun-smiths for carrying into effect.

THE SCREW FRIGATE "TRIBUNE."

The *Tribune*, 30, screw steam-frigate was taken out of the basin on Thursday, 26th ult., and went down the river at a quarter before four o'clock. The draught of water of this fine frigate, equal in size to many of the old 50-gun frigates, was 17 feet 3 inches aft and 14 feet 6 inches forward, and her screw 14 feet 1 inch in diameter, and in the line on length of keel 2 feet 10½ inches, with a pitch of 17 feet 6 inches. The means of disconnecting the propeller is by a T-head or propeller boss, drawn out of the clutch on the end of the shaft by raising the propeller. The mode of raising the propeller is very simple, the tackle being over a cross-head to the capstan. The engines are of 350-horse power, with tubular boilers level with 14 feet 6 inches water-line. There are twelve furnaces, and only one funnel, 5 feet 3½ inches in diameter, and 48 feet in height above the fire-bars, constructed on the telescopic principle, and so placed that the mainmast is 41 feet clear abaft from it. The engines are very compact, working on the direct-action principle, and made from 62 to 64 revolutions per minute, the contract number being 60.

THE TRADES OF BIRMINGHAM.

In the great majority of articles of ironmongery, such as locks, fire-irons, and hollow ware, made in the neighbourhood of Willenhall and Darlaston, the trade is unusually brisk, and as yet there has been no abatement of the demand for the Australian market. Plated goods are being sent out in immense quantities, and digging implements continue in great request. The difficulty at the present time in most of the trades of Birmingham is, to obtain work-people. Wages are good, and many of the operatives, in South Staffordshire more particularly, neglect to work full time. Even if the workmen were universally industrious in many branches of ironmongery, labour would be scarce, and wages proportionately more remunerative.

There has been no alteration in the copper market during the week. A rise of ½d. per lb. was expected on Tuesday; but from all we hear, although ore is now said to have a slight upward tendency, no advance in Birmingham has yet been determined upon. The manufacturers of brass and copper articles continue to complain of the injury done to their trades by the unsettled state of the metal market.

THE IRON TRADE.

Birmingham.—The principal matter of interest in the trade of this district during the past week has been the balance-sheet exhibited at the meeting of the creditors of Mr. John Attwood, held on Monday last. It has constituted the chief topic of conversation among the ironmasters and merchants of the town and neighbourhood ever since it made its appearance, and various and contradictory are the opinions expressed as to the prospects which it affords. The high reputation of Mr. Coleman for accuracy and judgment in matters of account and valuation inspires confidence among many; but there are creditors who, looking at the fact that first promises of this nature are seldom realized, look gloomily at the figures placed before them. An anticipated surplus of only 20,000*l.*, from so immense an estate as that possessed by Mr. Attwood, does not to these gentlemen afford any very cheering prospect. Such is the prevalence of this feeling that, at the commencement of the present week, we were informed debts were in the market at a price considerably under 20s. in the pound.

The declaration made at the meeting referred to, to the effect that the iron contracted for by Attwood will not be precipitately forced upon the market, will operate advantageously upon prices.

The pig trade in this district is still dull, but its prospects after this announcement are still more cheering. It is a well-known

fact, stated upon good authority, that since the late reductions, with coal and stone at present prices, pigs have been sold for less money than the cost of making. This has been more especially the case where parties have been in want of immediate cash. The demand for manufactured continues to be good, and prices upon the whole steady, although since the late shock there has been no difficulty in buying under quarter-day prices. The mills and forges of the district are in active operation, and the demand for rails is unabated. The heat of the weather during last week threatened to impede the operations of the puddlers, but generally they have resolutely stuck to work notwithstanding the fatigue and inconvenience to which they have been subjected. It was currently reported on 26th ult. that this class of ironmen were about to "strike," but the statement has not since been confirmed.

Glasgow Pig-Iron Market.—Glasgow, May 28.—Our pig-iron market has, during the past week, been very quiet; but prices have been well maintained to-day. Mixed number warrants may be quoted at 51s. 6d., with buyers at 51s.; No. 1 G. M. B., at 52s. to 52s. 6d.; Gartsherrie, at 55s. 6d.

America.—By the royal mail steamship *Asia*, which arrived at Liverpool on Saturday, with advices from New York to the 18th ult., we learn that Scotch pig-iron was in limited demand, at from 32 to 33 dollars per ton, usual credit.

STRINGFELLOW'S PATENT POCKET GALVANIC BATTERIES.

(Patent dated October 2, 1852.)

THE batteries described in the patent to which we wish to direct the attention of our readers, constitute a new curative means which medical practitioners have already availed themselves of to a very considerable extent, and with marked success. Until the appearance of Stringfellow's portable batteries, no convenient and efficient means existed of producing a mild and continuous stream of electricity, the action of which should not be subject to interruption from the patient's having occasion to go out of doors. The extraordinary and often instantaneous cures produced by such a current along the course of the affected nerves in various acute and chronic diseases, and the identity or close affinity of electricity with the nervous power, have long been admitted by the most eminent medical and scientific men; but the difficulty has hitherto been in procuring, applying, and maintaining such a current without subjecting the patient to intolerable restraint, and, during its application, the suspension of all ordinary avocations. By the present invention these objections and difficulties are obviated. It is portable, easy in its application, and certain in its action, and has received the highest testimonials, not only from the first medical men in England, but from many persons who have applied the batteries with wonderful success, in cases of rheumatism, nervous, neuralgic, and spinal affections, bronchitis, general debility, indigestion, and numerous other complaints. The merits of the invention have been amply investigated and recognized in the *Lancet*, to which Journal we would refer for a detailed account of its medical properties.

It will be seen from the subjoined description of the structure of the instrument, which is exhibited in the accompanying figures, that it consists of a number of elements proportioned to the intensity of current required, and folded together into a case no larger than a lady's card-case. The wires which communicate with its poles pass through two orifices in the top of the case, and are furnished with discs, or flat electrodes, which, by a small elastic string, may be easily secured on any part of the person.

The construction of the batteries will be readily understood on referring to the accompanying figures. Each element is formed, as usual, of two metals, one of which is electro positive to the other, zinc and copper being most commonly employed. The positive metal, zinc, in this combination, is placed in the interior of the element, in the form of an oblong plate, and around it is wound a light layer of some non-conducting substance, such as cotton, thread, silk, hair, small gut, or asbestos, for the purpose of insulating it from its electro negative. A broader plate of the negative metal, either in the form of gauze, or punched with circular holes, or two rows of transverse slots, is bent round the zinc plate thus covered, and its edges are then united by soldering. To complete each element, small pieces of flattened copper wire are inserted beneath, and soldered to, the negative metal, but insulated from the zinc by means of small strips of varnished paper. Fig. 1 represents a voltaic series, or battery, consisting of elements constructed upon the principle of Mr. Stringfellow's patent, in which the enveloping negative metal of each element is seen, with its transverse perforations, in metallic contact with the ends of the zinc plate in the adjacent one, by means of the flattened wires, which are

soldered to the zinc as well as to the copper. A great number of these small elements, combined in the manner described, produce, in the aggregate, a considerable effect, which renders them susceptible of being packed in an extremely small space, and yet be able to act with all the energy requisite for medical purposes. When so combined, these small batteries may be arranged in any number to form a larger battery of great intensity, by uniting the poles of one plate to those of the next in the series, by means of the projecting tubes CC^1, which are made hollow for the purpose of inserting the connecting wires.

The tube C is soldered to the zinc or positive pole, while C^1 is attached to the copper or negative pole.

Fig. 2 represents a system of plates constructed in the manner described. Instead

Fig. 3.

Fig. 1.

A

of a rigid connection throughout, however, there is a hinged joint, AA, which admits of the battery being folded, and inserted into a case as represented in Fig. 3, so as to be easily portable. The hinge is so arranged, that one side of it, or half the hinge, shall be in communication with the positive metal, while the other half is in connection with the negative metal. The projecting tubes, CC^1, are placed at the opposite ends of the series. There is another arrangement, in which the compound plates are hinged at their shorter edges. Either plan is equally effective, though not equally convenient for the purpose of manufacture, and any number of compound plates may be connected on either plan.

When required for use, the plates are excited by drawing along their surface a sponge moistened with diluted acid, the intensity of the current generated being dependent upon the strength of the exciting liquids. In order to convey the electric current generated by the batteries, the operator inserts into the projecting tubes, CC^1, metallic pins or snaps, similar to those used for connecting the ends of necklaces, and attaches to them flexible metallic bands or cords, terminating either in metallic discs, or points, according to the uses for which the current is to be employed. These flexible conducting cords are made in the following manner: — Around threads of cotton or silk thin strips of flattened wire are wound, and a series of threads so

covered are twisted together, so as to form a cord, or band, and which is afterwards braided with threads of silk or mohair.

In describing Mr. Stringfellow's patent, we have spoken of copper and zinc as the two electrically opposite metals employed; any two other metals, the one electro positive to the other, may, however, be used with more or less advantage. The patentee observes on this point, that he finds that batteries of great intensity are formed from plates of amalgamated zinc for the inside or positive metal, covered with perforated plates, flattened wire, or wire-gauze of platinized silver, for the outside or negative metal. Nor is it essential to the arrangement that the zinc should be inside the copper, or negative. The metals may be so combined, that the positive metal may form the interior, and the negative metal the exterior, or *vice versâ*.

To excite the battery so formed, it is only necessary to take it out of the case, and draw a small piece of sponge moistened with distilled vinegar, or one part of acetic acid to seven of water, several times down the centre on both sides of each fold, not wetting the painted edges, and taking care that there should not be sufficient vinegar to drop or run down, as the battery works much better when not too moist. The battery is now replaced in the case, so that the gold tube and the silver tube are connected with the positive and negative poles. Next insert the snap-ends of the conductors into these projecting tubes, the gold snap into the gold tube, the silver snap into the silver tube; the other ends of the conductors slide into the metallic discs, which are to be applied next the skin by means of the elastic bands or pieces of tape, to the portions of the body through which it is intended to pass the electric current.

The battery when in use may be carried in the pocket, or attached to any part of the garments, and the conductors applied in the manner most convenient to the wearer, so that the metallic discs are in contact with the skin, previously moistening them with a little water. A sufficient current of electricity may be passing without creating any sensation. Indeed, where, as in most cases, a gentle continuous stream is required, any pricking sensation continued beyond the first few minutes would show that the current was too powerful, and should be reduced by damping the battery with the distilled vinegar diluted, or by water only. After the battery has been in use some hours, and its strength diminished, it may be renewed by again moistening the plates. In applying the battery, as a rule, the diseased or painful part should be interposed between the two metallic discs; and as subsidence cannot take place in this arrangement, it will be necessary occasionally to wash the battery in clean water, with a tooth or nail-brush, and to let it dry before returning it to the case.

They are manufactured very neatly, by Mr. Stringfellow, at Chard, Somersetshire, and are now being sold in great numbers by the Messrs. Elliot, opticians, in the West Strand.

SOCIETY OF ARTS.

Sitting of Wednesday, May 25th.

The Twenty-second Ordinary Meeting of the Society was held on Wednesday, the 25th ult., Thomas Winkworth, Esq., Vice-president, in the chair.

A paper was read, "On Recent Improvements in Chronometers," by Mr. Loseby.

The paper commenced with a general description of the different parts of a chronometers, divided into the train, the escapement, and the balance, with its spring; and after giving various reasons to show the small advantage that could be derived from perfection of form in the train-wheel teeth, it proceeded to notice the escapement, where the first material difference between one kind of watch and another presented itself. The chronometer escapement was then described with the aid of large drawings, and the various points noticed which constitute its great superiority over all other balance escapements. Mr. Loseby then proceeded to observe, that it was a general opinion that the chronometer escapement is more subject to injury than the lever, and some other of the common escapements. So far, however, as concerned its liability to accident in actual use, he believed this opinion to be erroneous; for he had never known an instance where the detent had been broken in use, and the balance staff and other portions were quite as easily injured in the lever escapement as they were in the chronometer.

The various adjustments necessary in chronometers were enumerated, which were styled the *mental* workmanship, to distinguish it from the mechanical; as the most practised eye could not discover whether they had been made or not, and hence the great difference in value which might exist between one chronometer and another. After describing the isochronous adjustment for change of arc and the adjustment for positions, the paper proceeded to describe the second adjustment, which referred to the compensation for change of temperature; and which brought the au-

thor to that part of the subject to which it was his intention more particularly to allude, from its being the only portion of the chronometer in which any well-established improvement had been made within the last half century; all the finest chronometers being constructed, with this exception, precisely as they were fifty years ago. The ordinary compensation balance was then described with the aid of diagrams, and the method of adjusting it.

In speaking of the finest chronometers, those having the ordinary balance could not now be included; as their errors, when most perfectly adjusted, were still sufficiently large to be seen without very long trials, on account of what was generally called the supplemental error. This could not be corrected by the ordinary means, as the balance spring lost elastic force at an accumulating rate over the effect produced by the compound lamina of the balance, and consequently the chronometer could only be adjusted to keep the same rate at two points on the thermometer, between which it would alter.

The following appeared to the author to be the conditions which a perfect compensation for the secondary error should fulfil:

1.—It should gradually accumulate in effect from one extreme of temperature to the other, in the progression required by the change of elastic force in the balance spring.

2.—The secondary compensation should be susceptible of adjustment by rule alone; for if this could only be effected by actual trial, as in the primary compensation, the extra time required would preclude the probability of its coming into general use.

3.—After it has once been adjusted the compensation should remain permanent and not liable to derangement.

4.—The secondary compensation should not interfere in the slightest degree with the action of the primary compensation; for as the motion of the laminae in a large box chronometer only amounts to $\frac{1}{250}$ of an inch, to produce a difference in the rate of 380 seconds a day, in a change of temperature from 32° to 100° Fahr., any such interference would eventually prove fatal to the chronometer's good performance.

With reference to the first condition, he said, I find, by a great number of experiments and trials, extending over a period of ten years, partly made by myself and partly conducted at the Royal Observatory, Greenwich, that the law of loss of elastic force in the spring requires $\frac{1}{78}$ of the entire compensation to increase over the effect produced by the compound lamina, in the progression shown on diagram, where the distance gradually accumulates throughout.

The different plans proposed for removing the defect were divided into two classes, one of which included those methods in which auxiliary weights were brought into action at certain temperatures; the other, the plans intended to produce an accumulating effect throughout. The first class was represented by Mr. Eiffe's balance, and the second by Mr. Dent's, which were described by the aid of drawings, and their capabilities examined with reference to the conditions already laid down. The last method introduced was that patented by Mr. Loseby, in which mercury is employed to effect the secondary compensation. The principle and action of this balance were fully described, its ability to fulfil the necessary requirements tested by the conditions before applied to the others, and also the object for which Le Roy employed mercury in the balance during the last century.

Having considered the constructions themselves, and the principles on which they are based, the paper proceeded to notice the results obtained in actual trial. Fortunately, in this country, as in others, the Government had instituted trials of chronometers for many years past, and had thereby afforded a practical test of the advantages to be derived from the improvements proposed from time to time. At the present day, before any addition could be recognized as an improvement, it must have successfully established its title in the sharply-contested trials of the Royal Observatory. Mr. Loseby then proceeded to give an account of these trials, from two letters on the subject, addressed to the Board of Admiralty; one written by Mr. Dent, and the other by himself, from the latter of which the following Table is extracted, with the remarks immediately preceding it.

In extracting a summary from the rates, to show the reliance that can be permanently placed on the different constructions, he included a period of five years, as the rates exhibited great uncertainty of the same maker maintaining the same position one trial with another; not, however, that this would favour his chronometers, for they had not only obtained the first position, but kept it four years out of the five.

The first Table consisted of the errors of all the chronometers added together for the several years, and a mean taken of the whole; and the second Table contained the errors of Loseby's chronometers in the same years, so that a comparison of the two would show the amount of superiority in Loseby's chronometers over the general average.

Abstract from the Rates of all the Chronometers (140) which have been tried at the Royal Observatory, Greenwich, from 1848 to 1852.

Year.	Difference between the greatest and least weekly rate.	Greatest difference between one week's rate and the next.	Trial No.
	s.	s.	
1848	27·2	12·9	53·0
1849	34·0	23·4	80·8
1850	37·0	24·5	86·0
1851	29·6	17·5	64·6
1852	28·5	19·3	67·1
	156·3	97·6	351·5
Mean of 5 years.	31·3	19·5	70·3

Errors of Loseby's Chronometers in the same Trials.

Year.	Difference between the greatest and least weekly rate.	Greatest difference between one week's rate and the next.	Trial No.
	s.	s.	
1848	11·0	5·6	22·4
1849	17·3	9·2	35·7
1850	12·7	4·7	22·1
1851	16·5	4·4	25·3
1852	11·7	9·4	30·5
	69 2	33·3	136·0
Mean of 5 years.	13·8	6·7	27·2

Since 1848 the trials have been rendered more severe by the chronometers being exposed to greater extremes of temperature.

In the short discussion which ensued, Mr. Denison read the following Table of the comparative rates during equal periods of eight weeks, of cold, mean, and hot temperatures, of the most successful chronometers tried at Greenwich in the past five years, referred to by Mr. Loseby:

1848; range of temperature, 28 deg. to 87 deg.—

	Cold.	Mean.	Hot.
Loseby. . .	+1	+ 5·5	+ 3·3
Loseby . .	+1·7	+ 8·8	+ 5·1
Massey . .	−2·3	− 2·8	− 3·1

1849; temperature, 40 deg. to 91 deg.—

	Cold.	Mean.	Hot.
Loseby . .	+7·7	+12·1	+18·1
Eiffe . . .	−6·2	− 7·6	−10
Poole . . .	−9	− 5·8	− 3·6

1850; temperature, 22 deg. to 105 deg.—

	Cold.	Mean.	Hot.
Loseby . .	−9·7	− 6·9	− 9·2
Dent . . .	−8·6	− 7·5	− 8

1851; temperature, 28 deg. to 109 deg.—

	Cold.	Mean.	Hot.
Loseby . .	−1·7	− 3·2	− 9·8
Lawson . .	−3·5	− 2·2	− 4·2

1852; temperature, 21 deg. to 115 deg.—

	Cold.	Mean.	Hot.
Loseby . .	−9	− 6·5	− 6·7
Dent . . .	+4·6	+ 3·6	+ 4·8

The result was, that Mr. Loseby's chronometers had been beaten every year with respect to the secondary compensation, for which his invention was designed; once by Massey, Eiffe, Poole, and Lawson, and twice by Dent; and moreover, that in two out of the three years since the trials became more severe as to range of temperature, Dent's chronometers had beaten all the others in the accuracy of the compensation; consequently Mr. Loseby's compensation could not be regarded as superior, or even equal to several others which were invented before his. What Mr. Loseby had effected was, by the devotion of his mechanical skill, the getting up of one chronometer annually, of very great accuracy, as Mr. Dent had done in 1829; but that was a trial of skilful execution, not of scientific improvement. For this mechanical skill Mr. Loseby deserved great credit; and he, Mr. Denison, in his capacity of Reporter on Horology at the Great Exhibition, gave him all praise for his execution. His chronometers were not the best, however, for secondary compensation; nor would they be whilst those of Eiffe, Poole, Massey, Lawson, and Dent remained.

The Chairman intimated that the paper of Mr. Wenham would be read on Monday evening next, and the discussion of the present paper would also stand adjourned to the same evening. He proposed a vote of thanks to Mr. Loseby for his paper, which was carried unanimously.

It was also announced that, on Wednesday next, June 1st, being the last Ordinary Meeting of the present Session, the Council had determined to bring before the Society the Government announcement of the Universal Exhibition at Paris, in 1855, and to appoint a committee, with a view to promote the due representation of British manufactures, and to report on what steps may be taken for obtaining the removal of those restrictions that would at present interfere with the full representation of British manufactures in France, in 1855.

INSTITUTION OF CIVIL ENGINEERS. — THE PRESIDENT'S SOIREE.

The Session of the Institution of Civil Engineers attained its usual termination on Tuesday night in the conversazione given by the President, James Meadows Rendel, Esq., who received with his characteristic affability the *élite* of the world of science and literature to the number of many hundreds. Those who have experienced the pleasure of these charming *réunions*, and are able to appreciate the advantages to the engineering profession of the intercommunication of ideas of which they afford so agreeable and effective a vehicle, will be disposed to believe that, considering the numerous subjects of interest that have been brought forward at some of the recent sittings of the Institute, the present was one of peculiar interest. So, indeed, it was, whether regard be had to the number and distinction of the President's guests, or the extent, variety, and importance of the contributions forwarded for the occasion. The usual accompaniments of the occasion, moreover, were furnished forth on a scale of munificent hospitality, and we do not remember any anniversary of this occasion more completely effective in its design and execution, or more thoroughly appreciated and enjoyed by those who had the good fortune to be present.

An extremely extensive and valuable collection of models of machinery, philosophical instruments, and miscellaneous apparatus and articles was displayed in the theatre of the Institution and other parts of the building. Of these we have only space for a general sketch of the most remarkable, or most useful, some of which we were unable to examine with much minuteness, as it was impossible to pass from point to point without experiencing inconveniently the incompressibility of matter.

One of the most striking objects in the theatre was Mr. Bryan Donkin's fine machinery for making paper in one length, to be limited only by the continuity of the supply of pulp. The model of this machine is very large, though consisting of parts which separately occupy but little space. It will be remembered that a council medal was awarded to Mr. Donkin for this invention, the great characteristic of which consists in the admirable means employed for ensuring the purity of the pulp before it reaches the gauze upon which it is distributed. A succession of cam movements impart a slight vibratory motion to the surfaces near the tanks, which suffices to cause the minute particles of sand held in mechanical suspension to fall. The arrangements for drying, and for adjusting the pressure upon the fabric, are also remarkable for their ingenuity and efficiency. Though occupying a considerable space, the machinery is not nearly so expensive as might be supposed, and we understand that 1000*l*. is sufficient to cover the cost of the general structure, when made on a scale adequate to the requirements of a moderately large manufacture.

In one of the lobbies Mr. Donkin had a disc pumping-engine, acting upon a principle essentially identical with that of the disc steam-engine. Here, however, the operation of the machine might be described as being the converse of that of the disc-engine. The latter is employed to produce motion upon a shaft by means of steam-power acting against a circular disc revolving within a sphere provided with interior cones, against which diametric contact is made. Here the shaft is driven, and the disc with it. The rarefaction thus produced within the spherical figure acts upon the water with which the sphere communicates by a pipe, and raises it into the sphere, from whence it is expelled through the educt pipe by the continuous action of the machine. This new and very ingenious arrangement has been found extremely effective for the purpose just described, but its merits have been much more severely tested in its application to an object still more subtle in its nature. The bursting of retorts in gas factories has frequently arisen from the accumulation of pressure within them, which it is difficult to avoid by the ordinary means employed. Within the last half year, Donkin's disc-pump has been used for this purpose with complete success, it being found to draw off the products of the destructive distillation as they are formed. The disc principle has undoubtedly several advantages, of which its compactness is not among the least; and it will probably work its way more certainly by this application of its powers, than in the form in which it was originally proposed for practical purposes.

Messrs. Sharp and Stewart, of Manchester, exhibited a beautifully-made model of the mode of assembling the spokes of iron railway wheels, which attracted a good deal of observation; every joint, pin, flange-cover, and fastening being correctly exhibited.

Armstrong's hydraulic crane, of which a very elegant model was supplied, was exhibited in full operation. The principle of this apparatus renders it extremely valuable in certain situations. It is employed to

act upon the piston of a cylinder having a long stroke, and which, acting upon a simple and effective arrangement of pullies, raises with ease and great economy of time a very considerable load. Even the turning of the arm of the crane is managed by the engineer. A separate cylinder is provided for this purpose, the end of the piston of which is furnished with a rack, and this acts upon a large spur-wheel at the base of the standard of the crane. The model exhibited passed very satisfactorily the test of a considerable weight.

M. Alexis Soyer exhibited the roasting apparatus by gas, with which, a few weeks ago, he effected such wonderful results in the kitchen of Greenwich Hospital. Having only recently described the culinary performances of this arrangement in terms of high commendation, it is scarcely necessary that we should again recur to the subject, especially as we know "Soyer's gas-stove" is finding a place in every well-ordered kitchen. The great services, however, which this gentleman has rendered to the community of this country, by improving our systems of operation with reference to the adornments of the table, which Englishmen never shrink from acknowledging themselves to take a pride in, demand that we should give every means of publicity in our power to this new arrangement of his, —characterised, as it is, by the same ingenuity, with respect to the objects in view, as distinguishes his table-broiling apparatus, and other elegant and effective contrivances of a culinary kind. In No. 1845 of the *Mechanics' Magazine* will be found an account of the results achieved by M. Soyer's gas apparatus, and to that we now refer as an evidence of its value in the economy of time, fuel, and meat. By this apparatus, it will be seen, 36 legs of mutton, weighing 288 lbs., were roasted by gas at Greenwich Hospital, on the 11th March, at a cost of 1s. 2d. A leg of mutton was roasted also before a numerous party of scientific and medical gentlemen on the 27th ult., on a table in a dining-room, which produced neither smoke nor effluvia, nor was there hardly any heat felt from the apparatus. It weighed, before roasting, 7 lbs. 15 ozs.; when roasted, 5 lbs. 12 ozs.; dripping, 1 lb.; osmazome, or gravy, 6 ozs. It therefore only lost 13 ozs. by cooking, instead of which, by baking, the loss would have been at least one fourth.

As a further proof of its superior advantages, as compared with the ordinary process, the following fact should be considered. With all the appliances of the Reform Club, and the talents of its *chef de cuisine*, a leg of mutton which weighed 8 lbs. 8 ozs. before roasting, weighed only 6 lbs. 12 ozs. afterwards, having sustained a loss of 1 lb. 12 ozs. in the operation. In Soyer's apparatus there is no such loss. Experiment appears to have fixed upon 350° Fahrenheit as the temperature fit for roasting; and in this stove a turn or two of the gas-cock, and a reference to the thermometer, will adjust the temperature to that point with the greatest nicety. Being once attained, the roasting process goes forward without the necessity of the slightest trouble from attendants. The apparatus may be locked up and left to itself; and at the end of a certain time, which can be allowed for to a certainty, according to the weight of the meat, it will be found to be thoroughly cooked. In many of the best means at present employed for the same purpose, the exterior surface is too apt to become charred, in spite of roasting-jacks, and the most scrupulous attention. When the charring action has once commenced, a non-conducting surface is formed, which completely protects the general mass of fibre and its suspended fluids from the converting action of the heat. A failure thus frequently happens, commencing from an early stage of the process, where it is difficult to check its progress, even should it be observed. The absence of smoke, and the general cleanliness of the apparatus is another feature about it which should recommend it alike to mistresses and to cooks. The gravy and the fat are collected in a dripping-pan, and these being of different specific gravities, if they are poured into a funnel they will separate spontaneously, thus affording the means of drawing off the gravy by itself, unmixed with fatty particles. M. Soyer's stove was a subject of very general discussion, and the meritorious inventor had the satisfaction of receiving the expression of the approbation of many members of the nobility and higher classes who were present.

Mr. N. Defries had a large collection of gas-apparatus of various kinds, which also attracted much notice. His new dry-gas meter, of which the great feature is the construction of the central valve, was probably the most important of these. The ingenuity of this contrivance consists in there being a central and concentric circular orifice for the admission of the gas, while the educt valves are formed by open sectors around it, certain of which are opened and closed in a proper succession by the continual traversing of a segmental disc. The gas-range was a model on a large scale, and an elegant piece of workmanship. In the centre was a fire, of the capacity, perhaps, of only three cubic inches, giving out an intense heat. The fuel was gas, burning in foil platinum and

fire-brick—the Polytechnic, or Defries and Bachoffner's patent gas-fire—but the patentee also uses coal or coke. The intensity of the draught is such, the fire being enclosed, that no smoke can possibly happen; and a dinner for 500 persons could be cooked with a fire measuring 18 inches each way. On either side the fire was a range of three ovens. Baking was done in the two pairs adjoining the fire, and roasting in the pair beyond, the only adjunct necessary for this last purpose being the induction of a current of air. Above the range were a pair of hot chambers for plates. These and the other chambers of the range were kept heated by means of the flues and subsidiary pipes, which circulated round them. Mr. Defries also had a gas-cooking apparatus in operation, which contained an apparatus for boiling, at once simple and effective, consisting in a small and shallow extension of the boiling-vessel over the jets. This extension served at the same time to prevent the fluid-fat generated by the roasting from falling on the jets. To these the same gentleman added a model of his gas-heated bath, by which in six minutes, and at the cost 1½d., 46 gallons of water might be raised from 50 to 95 degrees of Fahr.

Westrup's flour-mill was illustrated by a well-made model, and was the subject of very general remark, as it has been since the trial in Wapping, when it was fully described in No. 1540 of the *Mechanics' Magazine*, to which we would now refer.

Beart's patent bricks were exhibited and explained. They were tested at Mr. J. Ransome's, the Orwell Works, Ipswich, and the following are the results of the experiments to test their crushing weight. The white perforated bricks, made of Huntingdonshire clay, bore a pressure of 31 cwt. per square inch, or 58 tons 18 cwt. on the whole surface of brick. When the pressure was removed, the brick was found to be broken in the middle, but not in the least crushed. When the brick was red instead of white, the result was precisely the same as in the previous experiment. It bore 31 cwt. per square inch, without being in the least crushed. Two solid bricks being used, one red and one white, made of the Suffolk clay, the brick crushed with 8¾ cwt. per square inch, equal to a pressure of 16 tons 12 cwt. on the whole surface of brick. These were the ordinary red and white brick of the county of Suffolk.

A very beautiful model of the traversing crane employed in the construction of the Portland break-water, and alluded to in Mr. Coode's paper on that subject, was exhibited in the theatre.

Mr. Moulton exhibited a great number of beautifully finished specimens of Marston's breech-loading and self-cleaning rifle. This excellent invention has been already noticed by us on former occasions, but a trial of them having taken place next day on Lord Ranelagh's estate at Putney, in the presence of Lord Ranelagh and several noblemen and gentlemen, a further notice of the invention will be found in another part of this number. The pieces were very much noticed, and the lever-principle generally admired.

Colonel Colt's revolvers also attracted much notice. There were several fine specimens of these celebrated weapons.

The Lancaster sewing-machine was also exhibited, and we believe arrested the attention of every one present by the regularity and perfection of its working.

M. Winiwärter, of Vienna, exhibited specimens of his new pistol, which formed the subject of a paper at the Society of Arts. He also had a pistol apparatus to show that the priming fire was effective for ignition at the distance of about a yard from the nipple, or point of impact. For this purpose, a long glass tube communicated with the fire-passage, and at the lower end of the tube a small stage, carrying a pledget of gun-cotton, was fixed by means of wire,—a distance of six or seven inches intervening between the end of the tube and the cotton. When the cap was fired, the cotton exploded simultaneously. Much attention was bestowed upon this circumstance, and M. Winiwärter intends applying this phenomenon to a new apparatus for submarine blasting.

A very fine model of Appold's centrifugal pump was at work on the central table, satisfactorily exhibiting, even on that small scale, the great capabilities of the machine.

Professor Wheatstone exhibited a philosophical instrument characterised by the ingenuity, simplicity, and elegance which belongs to everything that emanates from him. The intention was to illustrate the undulatory theory of light, and to show how the apparent progressive motion of a wave might exist, in the absence of any progressive motion whatever. The instrument consisted of an arrangement of white beads carried upon the ends of slender wires, which passed vertically or horizontally through transverse slots in the horizontal or vertical sides of the frame. On drawing backwards or forwards a smooth board with a sinuous slot cut in it, the beads formed themselves into a wave-line, which altered its form with the motion, and gave the appearance of its beads being in progressive motion with the propagation of the wave, though it was evident they had no such motion, as the wires which carried them moved only in the transverse slots. The changes of configu-

ration thus produced, gave rise to a succession of curves of double curvature extremely beautiful to contemplate.

Mr. Murphy exhibited the highly ingenious torsion railway communication invented by Dr. Brae, of Leeds, and described fully in No. 1546 of the *Mechanics' Magazine*.

Messrs. Maudslay and Sons had in the room some very beautiful models of their feathering screw-propeller, and of their direct-acting engines, one of them being a pair of inclined direct-acting engines. The general arrangement and workmanship of these were very much admired.

Mr. Slade exhibited his patent hoist, which was described by us in a recent Number (No. 1552), on which occasion also we pointed out its numerous advantages in large building operations, and these were fully recognised by those who examined its operation. Also some lathe machinery.

Messrs. Mare, of Blackwall, exhibited models of the *Himalaya* and other vessels constructed by them, which also attracted much notice.

Mr. Edwin Hill's newspaper stamping-machine was exhibited in full operation, and elicited very general admiration.

Mr. Moore's great circle-indicator, the anchors, and propellers of Mr. Roberts, of Manchester; Mr. E. A. Cowper's ring-valve for water-pumps; Mr. Deane's diving-helmet and apparatus, and machinery for cutting vertical and inclined grooves in coal, and a profusion of models of shipping, were included in the exhibition.

The walls of the Institution were graced with numerous coloured drawings of the internal arrangements of the Sydenham Crystal Palace and its surrounding grounds, which told by anticipation of its glories. Among other pictorial decorations, we noticed an admirably effective portrait of the Emperor Louis Napoleon, executed by Middleton; and a portrait of surpassing excellence, by Boxall.

The entire arrangements were under the care of Mr. Charles Manby, the excellent Secretary of the Institution, to whose exertions to render the evening as agreeable as possible to the guests of the President, their extreme enjoyment of it, notwithstanding the numbers present, was very largely attributable.

PROVISIONAL PROTECTIONS.

Dated April 14, 1853.

905. Thomas Haigh, of Skircoat, Halifax, York. The cleansing of pans and other culinary utensils.

Dated April 19, 1853.

943. Frederick Henry Smith, of Southwark. Improvements in apparatus for cleansing the interior of tubular boilers and other hollow articles.

Dated April 21, 1853.

959. Thomas Dunn, of Windsor Bridge Iron-works, Pendleton, near Manchester, engineer. Certain improvements in and applicable to boilers or apparatus for generating steam, and in apparatus connected therewith.

Dated April 23, 1853.

981. Henry Houldsworth, of Manchester, cotton-spinner. Improvements in machinery used for combing cotton, silk, silk waste, flax, tow, wool, and other fibrous substances.

Dated April 28, 1853.

1029. John Hetherington, of Manchester, machine-maker. Certain improvements in machinery for combing cotton, wool, silk waste, flax, tow, wool, and other fibrous substances.

Dated May 6, 1853.

1113. Thomas Murray, of Marygold, Berwick, Scotland, farmer. A new machine or implement for hoeing, cutting, and otherwise operating upon turnips or other agricultural produce.

Dated May 11, 1853.

1155. Jacob Brett, of Hanover-square, Middlesex, gentleman. Improvements in electric telegraph apparatus. Partly a communication.

1157. Samuel Cunliffe Lister, of Manningham, York, machine wool-comber. Improvements in treating and preparing before being spun, wool, cotton, and other fibrous materials.

1159. Henry Potter Burt, of Charlotte-row, London, civil engineer. Improvements in portabl houses.

1161. John Mottram, of the firm of Anne Robinson and Co., of Liverpool, Lancaster, ironmongers. Improvements in machinery for washing ores, and separating metals from earth or other compounds.

1163. John Bottomley, of Bradford, York, manufacturer. Improvements in the manufacture of textile fabrics.

1165. Alfred Bird, of Worcester-street, Birmingham, experimental chemist. Improvements in the means of communicating between guards and persons and the engine-driver of a railway train.

1167. Edmund Whitaker, of Rochdale, engineer, and James Walmsley the younger, of Smithy Bridge, near Rochdale, earthenware, manufacturer. Improvements in the manufacture of pipes, tiles, bricks, and slabs from clay.

1169. George Bell, of Powell-street, Goswell-street, Middlesex, gentleman. Improvements in obtaining liquid cement and pigments or paints.

1170. Abraham Matthews, of Denby-street, Pimlico, civil engineer. Improvements in disengaging boats from ships or other vessels.

1171. William Bull, of Battersea, Surrey, civil engineer. Improvements in direct-acting steam engines with fixed cylinders.

Dated May 12, 1853.

1173. James Parkes, of Birmingham, Warwick, manufacturer. A new or improved stopcock for regulating the flow of gases.

1175. Joseph Denton, of Prestwich, Lancaster, gentleman. Improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics.

1177. Julian Bernard, of Guildford-street, Russell-square, Middlesex, gentleman, and Edward Taylor Bellhouse, of Eagle Foundry, Manchester, engineer. Improvements in pressing and in extracting fluids.

Dated May 13, 1853.

1178. Charles Pooley, of Manchester, cotton-

spinner. An improved mode of feeding machines for opening, cleaning, blowing, and scutching cotton and other fibrous substances.

1179. Joseph Stayner Eidmans, of Lacey-terrace, Kennington road, Surrey, civil engineer. Certain improvements in umbrellas and parasols.

1180. John Arrowsmith, of Bilston, Stafford, engineer. A new or improved turn-table.

1181 George Bertram, of the firm of William and George Bertram, engineers, Edinburgh, Scotland. Improvements in the manufacture of paper.

1182. George Stiff, of Minerva Cottage, Christchurch-road, Brixton-hill, Surrey, gentleman. An improved construction of printing-machine.

1183. William Thomas, of Cheapside, London, merchant. Improvements in weaving narrow fabrics for binding.

1184. Charles Tetley, late of Bradford, York, gentleman, but now of Skinner-street, London. Improvements in rotatory engines.

1185. Robert Smith Bartleet, of Redditch, Worcester. Improvements in sewing-machines.

1186. Richard Archibald Brooman, of the firm Robertson, Brooman, and Co., of Fleet-street, London, patent agents. Improvements in the manufacture of hats. A communication.

1187. Edward Taylor Bellhouse, of Eagle Foundry, Manchester, Lancaster, engineer. Improvements in steam boilers.

Dated May 14, 1853.

1189. Richard Eades, of Birmingham, Warwick, blacksmith. A new or improved metallic wheel.

1190. George Fitzjames Russell, of Duke-street, Adelphi, Middlesex, gentleman. An apparatus for disengaging, lowering, and raising ships' boats.

1191. George Coppock, of Heaton Norris, Lancaster. Certain improvements in looms for weaving.

1192. John Browne, of Upper Charlotte-street, Middlesex, gentleman. Improvements in the construction of chimnies or flues, and in apparatus for increasing draught, consuming smoke, or utilizing the same.

1193. James Higgin, of Manchester, Lancaster, manufacturing chemist. Improvements in printing or dyeing woven or textile fabrics, and in the manufacturing of certain substances to be used in the arts or processes of dyeing and printing.

1194. Thomas Stephen Holt, of Manchester, Lancaster, engineer. Improvements in steam engines, which improvements are also applicable to the machinery or apparatus connected to steam boilers.

1195. Moses Poole, of Avenue-road, Regent's-park, Middlesex, gentleman. A new or improved machine for pegging boots or shoes. A communication from Edward L. Norfolk, United States.

1196. Herman Dirs Mertens, of Margate, Kent, solicitor. Improvements in preparing materials to be employed in making beer and other beverages. A communication.

1197. William John Warner, of King-street, Soho, Middlesex. Improvements in dry gas-meters.

1198. Francis Montgomery Jennings, of Cork, Ireland, manufacturing chemist. Improvements in treating wool, silk, feathers, and other animal matters, for softening and otherwise improving the quality of the same

1199. John O'Keefe, of Queen Anne-street, Liverpool, rose engine-turner. Improvements in the manufacture of watch-cases.

1200. Stephen Garrett, of Taunton-place, Grange-road, Bermondsey, Surrey, currier. Improvements in the preparing and tanning of skins, hides, or pelts of animals.

1201. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, London. Certain improvements in steam engines. A communication.

1202. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, London. Certain improvements in steam boilers. A communication.

1203. John Drumgoole Brady, of Cambridge-terrace, Middlesex, Esq. Improvements in knapsacks.

1204. Robert Walter Swinburne, of South Shields, Durham, glass manufacturer. Improvements in apparatus or machinery to be used in the manufacture of glass.

1205. Eugene Rolt, of St. John's Wood, Middlesex, composer of music. Certain improvements in pianofortes.

Dated May 16, 1853.

1206. Jean Jacques Joseph Jamin, of Jerrard-street, Middlesex, gentleman, and Alexander Symons, of the Strand, Middlesex, gentleman. Certain improvements in the manufacture of boots and shoes.

1207. Jean Emile Barse, chemist, of Paris. Improvements in the manufacture of grease or composition for lubricating the axles and moving parts of machinery.

1208. Thomas Richardson, of Newcastle-upon-Tyne, chemist. Improvements in the manufacture of certain compounds containing phosphoric acid.

1209. Robert Boyd, of Paisley, Renfrew, North Britain, merchant. Improvements in weaving.

1210. William Littell Tizard, of Aldgate High-street, London, brewers' engineer. Improvements in dredging-machines.

1211. Moreton Hassall Phillips, of Shrewsbury, Salop, gentleman. An improved gun.

1212. George Jones, of Birmingham, Warwick, engineer and ironfounder. Improvements in ventilating mines.

Dated May 17, 1853.

1214. Charles James Pownall, of Addison-road, Middlesex. gentleman. Improvements in the preparation and treatment of flax and other similar vegetable fibres.

1215. John Lee Stevens, of King William-street, London, civil engineer. Improvements in grates and stoves.

1216. Joseph Webb, of Mayfield-terrace, Dalston Middlesex. Improvements in rotatory engines.

1217. James Thomas George Vizetelly, of Peterborough-court, and Henry Richard Vizetelly, of Gough-square, London, printers and engravers. Improvements in printing-machines. A communication.

Dated May 18, 1853.

1220. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. Improvements in machinery for combing and preparing wool and other fibrous substances. A communication.

1222. John Haskett, of Wigmore-street, Middlesex. Improvements in anchors, to be called the "Ferdinand Martin Safety Anchor." A communication.

1224. Wharton Rye, of Collyhurst, Manchester, ironfounder. Certain improvements in kitchen ranges or fire-grates.

1226. Richard Thompson, of Finsbury Chambers, Blomfield-street, London, gentleman. Making perforated building-stone.

1228. John Barsham, of Kingston-upon-Thames, Surrey. Improvements in drying bricks, peat, and other articles.

1230. Edward Thornhill Simpson, of Calder Soap-works, Wakefield, York. Improvements in the manufacture of manure.

1232. William Gossage, of Widnes, Lancaster, manufacturing chemist. Improvements in the manufacture of alkali from common salt.

1234. Benjamin Newton, of Brighton, Sussex, mat-manufacturer. Improvements in the manufacture of mats.

1236. Edward Briggs, of Castleton-mills, Rochdale, Lancaster, manufacturer. Improvements in the manufacture of piled fabrics, and in the machinery or apparatus employed therein.

NOTICES OF INTENTION TO PROCEED.*

(*From the "London Gazette," May 27th, 1853.*)

26. Francis Edwards. Improvements in the method of lettering, figuring, and ornamenting the surface of enamel used for dials and other purposes.

80. James Fletcher. Certain improvements in machinery applicable to spinning, doubling, and winding of cotton, wool, flax, silk, and other fibrous materials.

105. Edward Tasker. The purposes of writing and drawing, called the writing and drawing tube.

(*From the "London Gazette," May 30th, 1853.*)

24. Thomas Shilton. Certain improvements in weighing-machines.

45. Thomas Pape. Improvements in circular frames, and in the fabrics and articles produced thereon.

63. John Deane. An improved construction of diving-helmet.

70. William Weild. Certain improvements in looms for weaving.

75. John Petrie, junior, and Samuel Taylor. Improvements in machinery for washing or scouring wool.

93. John Rumley. Certain improvements in pumps.

239. William Constable. Improvements in transmitting motive power to machinery, and in regulating the action of rotary machines.

251. Louis Guillaume Perreaux. Improvements in machinery or apparatus for testing and ascertaining the strength of yarn, thread, wire, strings, or fabrics.

472. Thomas Browne Jordan. Improvements in machinery for planing slate.

567. Jacques François Dupont de Bussac. Certain improvements in paving and covering places. A communication.

602. Edward Maitland Stapley. Improvements in machinery for breaking and dressing flax and other fibrous materials. A communication.

782. Robert Evans Peterson. An improved piston. A communication.

880. François Felix Verdie. Certain improvements in welding cast steel with iron, steel, cast iron, and other metals.

898. Moses Robinson. Certain improved means for preventing accidents on railways.

943. Frederick Henry Smith. Improvements in apparatus for cleansing the interior of tubular boilers and other hollow articles.

946. Thomas Day. A certain improvement in the manufacture of boots and shoes, whereby great ease is secured to the wearer.

1010. John Hetherington, and John Dugdale the younger, and Edward Dugdale. Improvements in constructing and applying models or patterns for moulding, preparatory to casting iron, brass, and other metals for various purposes.

1029. John Hetherington. Certain improvements in machinery for combing cotton, wool, silk waste, flax, tow, and other fibrous substances.

1032. Peter Fairbairn and Ferdinand Kaselowsky. Improvements in machinery for drawing, roving, and spinning flax, hemp, and other fibrous substances.

1075. Richard Quin. Improvements in the manufacture of cases for jewellery, for optical and other instruments, miniatures, and other articles.

1096. Thomas Taylor. Improvements in apparatus for measuring and for governing the flow of water and other liquids.

1097. William Edward Newton. Improvements in apparatus for rolling iron. A communication.

1108. John Hetherington. Improvements in preparing cotton, wool, flax, silk, and other fibrous substances for spinning.

1118. John Thomas Stroud. Improvements in the valves of pressure-lamps, and in lamp-burners.

1130. William Boggett and George Brooks Pettitt. Improvements in apparatus for heating by gas.

1147. Robert Brown. Improvements in lifting and forcing water and other fluids.

1154. Samuel Russell. Improvements in handles for razors.

1157. Samuel Cunliffe Lister. Improvements in treating and preparing before being spun, wool, cotton, and other fibrous materials.

1165. Alfred Bird. Improvements in the means of communicating between guards or persons and the engine-driver of a railway train.

1169. George Bell. Improvements in obtaining liquid cement and pigments or paints.

1175. Joseph Denton. Improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics.

1181. George Bertram. Improvements in the manufacture of paper.

1184. Charles Tetley. Improvements in rotatory engines.

1185. Robert Smith Bartlett. Improvements in sewing-machines.

1193. James Higgin. Improvements in printing or dyeing woven or textile fabrics, and in the manufacturing of certain substances to be used in the arts or processes of dyeing and printing.

1196. Herman Dirs Mertens. Improvements in preparing materials to be employed in making beer and other beverages. A communication.

1197. William John Warner. Improvements in dry gas-meters.

1207. Jean Emile Barse. Improvements in the manufacture of grease or composition for lubricating the axles and moving parts of machinery.

1208. Thomas Richardson. Improvements in the manufacture of certain compounds containing phosphoric acid.

1211. Moreton Hassall Phillips. An improved gun.

1230. Edward Thornhill Simpson. Improvements in the manufacture of manure.

1234. Benjamin Newton. Improvements in the manufacture of mats.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed May 27, 1853.

1852:

905. Matthew Samuel Kendrick.

906. Matthew Samuel Kendrick.

912. William Jeffs.

914. James Mayelston Haldon.
922. Andrew Edmund Brae.

Sealed May 31, 1853.

1852:
923. Charles Hart.
925. George Augustus Huddart.
926. Charles Walker.
930. John Dable and William Wells.
937. Ebenezer Poulson.
957. John Rowbotham.
967. Richard Archibald Brooman.
989. Richard Archibald Brooman.
997. William Baddeley.
1021. Julian Boilesve.
1089. Frederick Bramwell.
1169. John Frederick Gordon.
1199. Thomas Walker.
1200. Thomas Walker.

1853:
328.
449. William Wilkinson.
496. Admiral Earl Dundonald.
584. Samuel Cunliffe Lister.
600. Theophilus John Nash.
698. Samuel McCormick.
720. George Isaac Jackson and Henry David Jackson.
740. George Edward Dering.
796. William Edward Newton.
798. Robert William Sievier and James Crosby.
801. William Walker.
823. Frederick Albert Gatty.
837. Edward Langdon Bryan.
839. Robert Pattison Clark.
848. Alexander Samuel Braden.
851. Henry Oliver Robinson.
852. George Herbert.
878. Thomas Greenwood.
923. Joseph Dunning.

Sealed June 2, 1853.

1852:
934. William Keld Whytehead.
945. Cornelius De Bergue.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
May 31	3467	R. W. Winfield	Birmingham	Gas-burner.
,,	3468	Mills and Whittaker	Oldham	Throttle-valve.
,,	3469	J. D. Brady	Hyde-park	Knapsack.
June 1	3470	J. G. Reynolds	City-road	Area-proteos, or emigrants' house.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

May 28	516	T. Bourne	Smithfield	Buckle.
June 1	517	W. Parsons	Chelsea	Floor-cramp.

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BROOMAN'S PATENT SAWS AND SAW-MILLS.

Fig. 5.

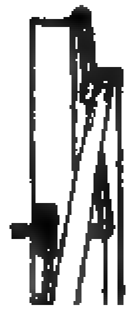


Fig. 1.

Fig. 4.

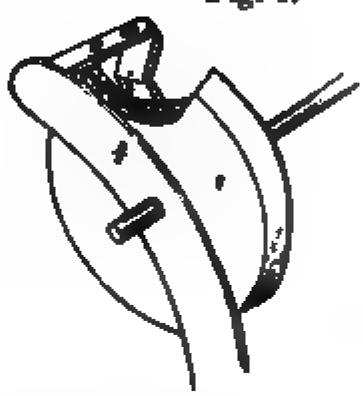


Fig. 6.

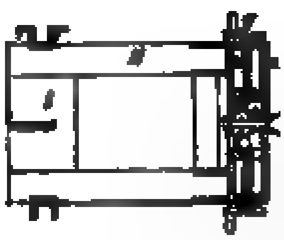
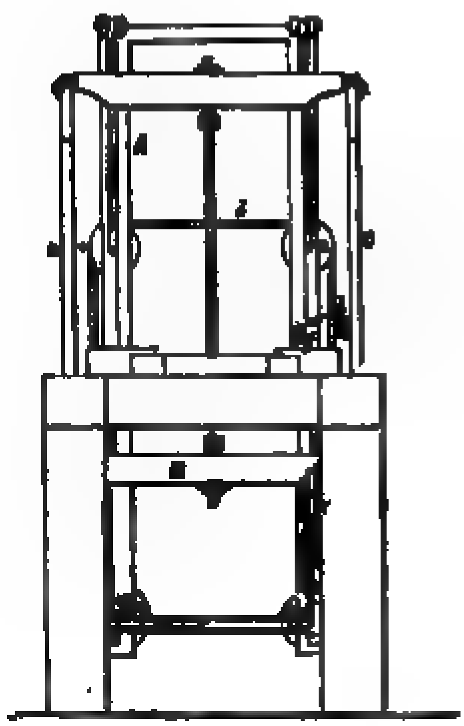


Fig. 2.



BROOMAN'S PATENT SAWS AND SAW-MILLS.

(Patent dated December 6, 1852.)

THE first portion of the patent describes improvements in saws, and the second, in saw-mills. The improvements in the construction of saws, consist in so forming the teeth that they shall act as chisels, or planes, and cut away the wood for forming the "kerf," or saw-groove, instead of tearing or rasping it, as is the case with ordinary saws now in use. The saws are made as follows:—The notches are first cut in the saw-plate in any well-known manner, and the teeth are formed between them. The outer edges or faces of the whole series of teeth are in the same right line in reciprocating saws, and in the same circle in circular saws. The cutting edges of the teeth are usually formed by upsetting and inclining outwards the acute angles at the forward ends of their outer edges or faces. This is done by means of a forked punch, which is driven by a hammer. The teeth may be set in the usual manner, for the purpose of clearing themselves, but it is preferred by the patentee to allow them to remain in the same plane with the saw-plate, and to spread out their cutting-edges on each side, sufficiently to form a suitable width of "kerf," for the saw-plate to play in freely.

After upsetting and throwing the cutting points of the saw-teeth outward, it is advisable to remove a sufficient quantity of metal from the front of their extremities, by means of a file or stone, so as to bring the cutting edges all on to the same right line in straight saws, and to the same circular line in circular saws, and also a sufficient quantity to give firmness and strength to the outline of the cutting edges of the teeth. In the same manner, a sufficient quantity is removed from the sides of the extremities of the cutting edges of the teeth, so as to bring both of the sides into planes parallel to each other, and also to give the requisite strength to the outline of the cutting edges of the teeth. The points, or cutting edges of the teeth, are raised above their outer edges a distance equal to the thickness of the chip that each tooth is intended to remove.

When the teeth are large and massive, as in mill-saws, they may have their points set up with greater facility and regularity, by means of an anvil and punch of peculiar form and arrangement, which are described. The shape of the cutting edges of the teeth will correspond with that of the punch, or of the punch and anvil, and consequently they may receive the shape of chisels, gouges, or any other shape best adapted to the particular kind of work to which they are to be applied. Under this arrangement, each of the saw-teeth will cut off clearly and smoothly a portion of the wood equal to the distance that its cutting edge projects from the outer face, instead of exerting the scraping action upon the wood, as is the case with saw-teeth constructed in the usual manner.

The improvements in saw-mills described in the second part of the patent, are represented in the accompanying figures, of which fig. 1 is a top view of a saw-mill constructed according to the principle of this invention; fig. 2, an end view; fig. 3, a longitudinal section; fig. 4, a detached portion of the mill arranged for sawing logs; fig. 5, a side view; and fig. 6, a detached portion of the mill as arranged for re-sawing boards, &c.

They consist; Firstly,—In the employment of inclined ways for the saw-gate, for the purpose of causing the saw-gate to strike forward as it descends, and to retreat backward as it rises; by which arrangement the saw is enabled to be placed in a straight position within its gate, and to be more uniformly strained and with a greater degree of tension than usual. The result is to cause the teeth to cut with greater energy and uniformity than when arranged in inclined positions within their supporting frames, or gates, in the usual manner.

Secondly,—In making the saw-gate ways adjustable, whereby the action of the saw, placed in the gate, can be varied to suit the nature and depth of the material to be operated upon.

Thirdly,—In the combination with each other of all the ways of the saw-gate, in such a manner that they can be simultaneously varied and adjusted in their positions whilst the saw-gate is in motion.

Fourthly,—In the arrangement of the feeding apparatus, in connection with the saw-gate and the adjustable ways, so that the feed-motion communicated to the material operated upon will invariably be in perfect harmony with the cut of the saw, and consequently in connection with the third feature; this arrangement will enable the operator to vary instantaneously the amount of action of the saw, when it is desirable to ease it in passing through knots, or to adapt it to the nature of the materials.

The ways, *a a*, of the saw-gate, B, are hinged to the fender-posts, A A, and are all connected with each other by means of the screws, *b b*, which pass through female screws in

the centres of the pulleys, *c c*; these pulleys working in slots in the fender-posts, or in suitable guides, and are all connected by an endless band or chain, *d*. By imparting motion therefore to the series of pulleys, *c c*, the ways, *a a*, of the saw-gate can be varied in their inclination to any desired extent.

Feeding motion is imparted to the carriage, G, from the saw-gate in the following manner. A transverse shaft, E, rests in suitable bearings under the carriage and within a short distance of the fender-posts, which shaft is connected to the carriage by means of a rope, *q*, having a turn around a pulley fixed upon it, and with its ends secured to the ends of the carriage, or by means of a pinion on the shaft gearing into a rack on the carriage, in the usual manner. A feeding-wheel, *e*, is secured to the shaft, E, by the side of the wheel, *e*. A lever, *f*, is also placed upon the shaft, E, and works freely upon it. An arm, *g*, projects from the upper end of the lever, *f*, over the top of the wheel, *e*. A gripper, *i*, is jointed to the underside of the arm, *g*, and is drawn against the side of the wheel, *e*, opposite to the lever, *f*, by the spring, *h*. When the lever, *f*, is made to revolve upon the shaft, E, the gripper, *i*, will glide freely in one direction over the surface of the wheel, *e*, and when moved in an opposite direction, the gripper will press so firmly against the side of the wheel as to impart its own motion to it. The advantage of the curvilinear movement of the feeding gripper, or hand, over the ordinary tangential movement of the feeding-hand, consists in its being adapted to impart a greater degree of motion to the feeding-wheel, and also in its being more certain and positive in its action.

Motion is imparted to the lever, *f*, from the saw-gate by the bar, *j*, the angular lever, *k*, and the short bar, *o*, as shown in fig. 8. The bar, *j*, and lever, *k*, are connected to one of the saw-gate ways, *a*, by means of the bar, *l*, the lever, *m*, and the bar, *n*, as shown in the same figure, by which arrangement the amount of motion imparted by the saw-gate to the carriage, G, will be regulated by, and exactly correspond with, the amount of horizontal forward movement imparted by the ways, *a a*, to the saw-gate as it descends; that is to say, the bent and slotted lever, *k*, the bar, *j*, and the bar, *l*, are connected to each other and to the lever, *k*, by means of a joint-pin, *z*, which plays freely in a slot in the upright portion of the lever, *k*, the lower end of the bar, *e*, being jointed to the end of the long arm of the lever, *m*. The short arm of the lever being also jointed to the lower end of one of the ways, *a*, of the saw-gate, by means of the bar, *n*, it will be perceived that when the inclination of the series of ways, *a a*, of the saw-gate, is varied, the pivot, *z*, will be moved in the slot in the short arm of the lever, *k*, which will vary the amount of motion imparted to the carriage, and cause it to correspond exactly with the degree of inclination given to the ways of the saw-gate, and the amount of forward horizontal motion imparted by them to the saw-gate during its descent.

For slitting or re-sawing planks, boards, &c., a mill may be constructed in the following exceedingly simple manner; viz., the fender-posts of a suitable frame are combined with the adjustable ways, *a a*, and the saw-gate, B, substantially, and a carriage, H, fig. 6, is placed upon suitable bearings, and connected to the sides of the saw-gate by means of the embracing ledges, *r r*, secured to the sides of the carriage. The saw plays in a slot in the forward end of the carriage, and a pressing-roller is combined with it, for the purpose of holding the board when it is operated upon by the saw. At the rear-end of the carriage, H, are arranged spring clamps, *t t*, in such a manner that when the carriage is moved rearward during the down stroke of the saw, they will glide freely over the sides of the board, and when the carriage is moved forward by the upward stroke of the saw, they will grip the board and carry it forward, to be again acted upon by the saw. The jaws, *t t*, of the clamps are arranged and actuated in the following manner:—They are connected to boxes, *u u*, by means of the forwardly inclining short arms, *v v*, the boxes, *u u*, being secured between the ways, *s s*, and slide freely therein. Set screws, *x x*, pass through the openings in the connecting-ends of the ways, *s s*, and pass into female screws in the boxes, *u u*. Springs, *w w*, are connected to the tops of the boxes, *u u*, and press backward against the front sides of the bars, *v v*, for the purpose of causing the jaws, *t t*, to bear lightly against the board, and prevent the jaws from gliding over the same when they are moved forward. It will therefore be perceived, that when the carriage is moved backward, the arms, *v v*, having nearly free forward play, allow the jaws, *t t*, to glide over the board placed between them; and when the carriage is moved forward, the light pressure of the jaws, *t t*, upon the board will cause them to incline the bars, *v v*, to the rear, and thereby force the jaws upward, and make them firmly grip and carry forward whatever may be embraced between them. The set screws, *x x*, and the cranks, *y y*, upon the same, serve to vary the positions of the feeding clamps, and to adapt them to the different thicknesses of material to be operated upon.

THE DARIEN SHIP CANAL.

The physical circumstances involved in the construction of the Darien Ship Canal, have been well discussed in a paper on the subject, by Mr. A. G. Findlay, F.R.G.S., which was read at the twenty-first ordinary meeting of the Society of Arts, the Rev. James Booth, L.L.D., F.R.S., in the chair. The subjoined extracts refer to this portion of the subject:

The existence of the American continent in modern European history is a recent fact, not older than very many of the most familiar ecclesiastical and other edifices around us; yet European art and civilization have almost totally displaced the original systems which existed at the period of the re-discovery by Columbus. The Spanish and Portuguese influences have extended in the central portions chiefly, or those more assimilated to the parent climate, not farther north or south than 30° or 35°, while the more vigorous Anglo-Saxon race have industriously pursued wealth and commerce in the more temperate or changing climates of the north or south.

Yet during the very earliest periods of European possession the Isthmian Canal was a great desideratum, and Cortes obtained a grant of land in Tehuantepec, which he proposed to enhance the value of, by connecting the two oceans across it. This fact, which was subsequently often mooted, is important to be remembered now, in the present immensely increased necessity for it.

The object of this paper will be to show the peculiarity of the geographical position of the American Isthmus, and, consequently, the peculiarity of its climate; of some hitherto unnoticed influences in the current systems which centre here, and which bear most strongly upon any system of navigation;—then to show what new fields for commercial enterprise it will open, and what existing advantages it will increase.

The revolution of the earth and the solar heat cause the phenomena of the trade winds within the tropics. These blow from N.E. and S.E., meeting near, but not on, the equator,—a fact due to the unequal distribution of land and water in the two hemispheres. The line of junction is between latitude 4° and 10° N., and Panama lies in this interval, and suffers accordingly from the calms and changing winds due to its position. This belt of calms is a very great obstacle to ships crossing it in the Atlantic and Pacific. It has a great influence on climate also; for the trade winds being evaporating winds, on meeting, deposit the water with which they are then saturated, and Panama during the time of the sun's north declination is deluged with rain, in quantities sufficient to fill the high level of any canal which might be formed with locks.

To the direction of winds that of currents is mainly owing, and the waters of each ocean circulate around the parallel of 30° N. or S. In the Atlantic the water is all forced into the Gulf of Mexico, and is presumed to raise its normal level, from the fact that the Gulf-stream rushes out of it in an opposite direction. This crossing the Atlantic from W. to E. ameliorates the climate of the British Islands, which would otherwise be like Labrador, in the same latitude. If the same process went on in the Pacific, and its waters were all propelled to westward, the Pacific side would be many feet lower than the Atlantic; but a current, hitherto overlooked, runs from W. to E. under the belt of calms, entirely across the Pacific into the Bay of Panama, and thus compensates the level, which is sensibly the same. The currents of the Pacific set up the coast of South America towards the Bay of Panama, and another, the continuation of the Japanese current, unnoticed hitherto, but an analogous current-stream to the Gulf-stream of the Atlantic, runs down the coast of Mexico and California also towards the Bay. Thus, Nature seems to indicate, both by winds and currents, that ships crossing the ocean from E. to W. must do so between 30° and the equator, and from W. to E. in a higher latitude than this.

Of the navigation of the North Atlantic, either by steam or sail, it is needless to speak; the distances, times, and relays for coaling have been long tried and tested, and therefore it may be presumed that in each case these particulars are minimised. But the steam voyages to Australia, entering upon new ground, have been most decided failures as yet, and in almost every case have been beaten by ordinary sailing vessels. There must be some general reason for this series of failures, besides the inefficiency of the ships, and I think it may be sought for in the great variety of circumstances that the navigation around the Cabo Tormentoso —the Stormy Cape of the Portuguese, or the Cape of Good Hope of the Dutch—will carry a vessel through. It is seen that the whole system of winds and currents are intersected in this voyage, and therefore, that in the main they are both adverse, and the actual distances to be traversed are very great.

We now come to that part of our subject which relates to the absolute distances which will he thrown open to shipping by the canal, compared with those at present followed; or, what is still more important, the absolute time that it may be expected

may be saved by it. With respect to our Eastern possessions in India, China, and Australia, there is a wonderfully great similarity in the distances which must now be sailed over to reach any of them from England. Thus, the mean sailing distances, which we take from Captain Wise's interesting analysis of 100 voyages, is, from England to Bombay, 13,424 miles—time, 115 days, 15 hours; from England to Madras, 13,629 miles—time, 106 days, 16 hours; England to Bengal (Calcutta), 14,405 miles—time, 105 days, 7 hours; and from England to China, 15,238 miles. The distance necessary to be sailed to Adelaide may be about 14,200 miles, and to Sydney, 15,500 miles, around the Cape of Good Hope, or, by steam, 13,880 miles, to be performed in 63 days.

The shorter routes—known as the overland routes from the Mediterranean to the Red Sea, a portion of which has been long established—would make the distance to Sydney, *viâ* Torres Strait, about 13,288 miles; but in the outward passage the wind and current would be almost always adverse, so that this length must be increased, on the score of current alone, perhaps 1,000 miles. The time calculated by Captain Hamond for this route is 75 days. The distance and time to the westward of Australia, which avoids all the terrors to steam navigation in Torres Strait, would be about the same. Now, it will be seen that these distances represent considerably more than half the circumference of the globe; moreover, they lead through seas where the winds are, at seasons, in most furious opposition to their progress—the currents, also most violent. It is only of late years, that to beat against the adverse monsoon has been attempted; and it is stated, that one of the fine steamers employed in the Oriental transit was compelled to burn nearly every available part of her construction, when, having run short of fuel, deck, spars, rigging, and cargo, were all cut up. Such an occurrence in the Pacific would be most serious.

Turning our attention to the routes in the opposite direction, or across the Isthmus and Pacific, a very different order of navigation will exist. The Pacific deserves its name; fine weather and moderate breezes prevail almost entirely across it—the western portions, perhaps, excepted. In these respects, it differs widely from the Atlantic, where, perhaps, from the accumulation of the trade winds over the eastern continent, they are impelled with great force on the comparatively narrow breadth of the ocean.

The shortest distance across the Atlantic, from the Lizard to Chagres, and which, perhaps, might be implicitly followed in the homeward route, is 4,666 miles, which, if a steam vessel can make good ten knots an hour, would be traversed in 20 days, exclusive of the relay if necessary at the Bermudas. In the first part of her voyage out, the mean direction of the wind and current would be adverse, or favourable on her return; and the latter portion of this would be reversed, so that these would neutralize each other, and the distance remain the same. The passage of the canal could be made in a few hours.

The shortest distance from the Gulf of San Miguel to the North Cape of New Zealand is 6,715 miles, and leads thence to Sydney, about 1,060 miles farther, which, at ten knots, would occupy 32 days; so that the entire distance from the Lizard to Sydney by this route is 12,460 miles, or, 1,400 miles shorter than by the Cape of Good Hope, and might be done in 53 days' actual steaming; and as it is presumed that this course would be nearly the best for a sailing vessel, it is shorter by nearly 3,000 miles than the eastern route for this class.

But there is another feature in this route. The winds are favourable for the passage either way; and outwards, after passing the Galápagos, she will be assisted by a current of 20 miles per day as far as the tropics, by which the distance will be shortened some 300 miles; beyond this they will probably balance themselves. It is presumed that one stoppage for coal, &c., will be sufficient between the Isthmus and New Zealand or Sydney. By the chart, Tahiti appears to be the best place, as being midway, and in the line; but there are some reasons why another port would be preferable. In the first place, the Society Islands are under French domination, and might not be so advantageous to British ships as one more independent. I, therefore, beg to propose that the Gambier Islands, or Manga Reva Group, which possess all the requisite advantages of, with some superiority over, the Tahitian Islands. In the first place, it has a good harbour, and abundance of fresh water. It is lofty, 1,250 feet high, and at present uncolonized. It lies near the great circle route, 3,700 miles from Panama, and 3,960 from Sydney. Of still greater importance, it lies to windward of the Low or Dangerous Archipelago, which, with this exception, are exclusively coral formations. Tahiti, then, would be a most dangerous landfall either for a steamer or sailing vessel. Should a steamer become disabled, or exhaust her fuel, before reaching her port, she might not be able to weather it, when she would drift by wind and current to Tahiti; whereas, if she made for the latter, and missed, then the next chance would be to make for the Cook's Islands, 500 miles

to leeward, or, still worse, for the Tonga Group, 1,400 miles to leeward. It is presumed that a sailing vessel could always reach, with proper management, to any port of New Zealand, from the Canal, in 40 to 45, and probably in 30 days; and if 30 days be occupied from Europe to the West Indies, this will be greatly under the time at present occupied. The return route round Cape Horn, that terror of navigators, would never occur; all Pacific return navigation would be through the Canal. Of the American ports nothing need be said; the advantages of time gained by the transit of the Isthmus are manifest.

The shortest route to China and Japan will be along the American coast as high as San Francisco. In the westward passage, towards the southern ports, perhaps the same advantages may be gained by making for the Sandwich Islands; and if this indirect route be taken, it will be about 9,000 miles, which might occupy a quick steamer forty to forty-five days: she would have fair winds the whole voyage, and be advanced by the favourable current to the extent of about 600 miles. But the return voyage between these ports is a different matter, and, it is contended, would be lengthened by these adverse circumstances to a length equivalent perhaps to 1,800 or 2,000 miles, that is to 10,800 or 11,000 miles, which would quite neutralize any advantages of the canal. But if the great circle route be taken along Japan, the actual distance will be 8,400 miles, which might be steamed over in thirty-five days, and would be assisted in every probability 700 miles on the voyage by currents. The winds would be favourable during the whole course, and this too might be equivalent to as much; so that the figures would stand as 6,600 to 11,000 miles for the low and high latitude.

Without dilating on other or shorter voyages, it may be safely asserted, that for all the eastern ports of Australia, China, or the Asiatic Archipelago, although they lie from 60° to 120° of longitude nearer to us by the eastern route, yet they may be reached by tracks shorter by from 1,200 to 3,600 miles, with every advantage of wind and current, which may perhaps be taken at so much more.

It has been shown that in long voyages there are belts of calms; absolute calms must be crossed, particularly in the Atlantic, which narrow space follows up on a mean 7 days, varying in the 100 voyages cited by Mr. Wise, from three to 15 days. In the 112¼ days mean passage to India, 36¼ days are occupied in calms and light airs; 63½ days in fair winds; and 12¾ days in foul winds. By the use of auxiliary steam, the calculation is, that by slight auxiliary steam-power the Indian voyage may be shortened to 85 days, or by steam up to a better track to even 69 days.

In the Pacific the winds are comparatively light, and perhaps, as a mean, would not command more than 7 or 8 knots in a sailing-vessel. Supposing, therefore, that auxiliary steam is used to make up the speed to 10 knots, much even of this is neutralised; for supposing the ship to be propelled with this velocity, and the wind is abeam with a strength equivalent to 8 knots, she will shift the wind two or three points ahead, and cause it to be still more adverse with lighter breezes. It may be, even, that a very light wind aft may, with quick speed, come out dead ahead, so that sails are worse than useless. This renders consideration to the currents of much greater importance.

The progress of steam in the Pacific will depend on the abundance of coal. Fortunately Nature has been as bountiful in this respect here as elsewhere. For the Australian route it must be taken to the intermediate station, and Talcahuana or New Zealand afford ready sources. In the north we have more convenient sites. It has been said by Dr. Coulter, that he found it in the Galapagos; but this must reasonably be doubted. It has been found up the Columbia River. In Admiralty Inlet, and in Vancouver's Island it is very abundant and excellent. It probably abounds, and certainly exists in Cook's Inlet. It has been worked in Aliaska. It is found in the Aleutian Islands and in Behring's Strait. It is worked in Japan and in the Philippine Islands; and with a ready and certain market, it might be worked in all these places. Wood has been proposed and tried. It may be had for the cutting in the north and south; but from its weak powers, I hear, it cannot be depended on for steam fuel-steam; a slight addition of coal greatly increases its strength, and it is here suggested that bitumen might be available as an adjunct. There is a bitumen-spring near Santa Elena Point, in Ecuador, close to the sea. It has been noticed by Dampier, and still exists as found by Lieutenant Wood, in H. M. S. *Pandora*. Another is found between Point Dume and at Point Vicente, in Upper California; and it becomes an interesting question whether these and others might not be used in improving fuel.

A few words as to the commerce it will open up and bring to our own country. There is not a richer mineral part in the world than the west portion of Ecuador and Peru. The great distance it is from Europe, around Cape Horn, precludes anything but the most valuable of its products reaching us; but there can be no doubt

that a shorter transit will confer great value upon many natural products which are now most abundant and worthless. One very important item will be thus greatly increased,—the vast deposits of guano on the Peruvian coasts, from which millions of tons may be brought here. The alkaline compounds which cover the plains of Bolivia may be brought into service, and the immense metallic deposits will thus be made one-half, or rather two-thirds, nearer Europe.

All the products of South-Western America will bear a proportionately increased value, and create an outlet for industry and speculation. In the north, our American brethren are vigorously pursuing commerce in their new region of California, and one fact will prove what openings there are for increase of commerce. In the month of January, 1853, there were cleared from the Port of San Francisco, 128 vessels, of the aggregate burthen of 47,194 tons. Five years since, a few stray ships found their way here annually, in search of water from the poor and destitute Spanish occupants. A new expedition is now to be fitted out at New York for the exploration and advancement of the capabilities of the N. W. coast. American colonies are being founded all along the coast to the northward, pioneers of future industry and wealth. Our own territories to the northward are as yet untried and unvisited, but possess all the capabilities of northern Europe. Russian America is a terra incognita—its capabilities are unknown.

The Americans boast that the commerce of the Pacific will be their inheritance;—let us see what it is. A chart with its array of names gives a very exaggerated notion of the lands between the eastern and western worlds. They are, with the exception of the few volcanic groups, mere specks or narrow strips of land, even with the water's edge, and are immensely populous. The entire insular population of the Pacific has been rated at 20,000,000; but from a careful summary it does not much exceed 1,500,000 to 1,750,000, and this including New Zealand and Australia. The area of the Caroline Islands does not exceed that of the town of Liverpool, yet the population amounts to above 500 per square mile. This is the case with all the coral islands; so that the whole care of the natives must be in procuring food. The only articles as yet gathered are *biche de mar*, or sea-slug—an aphrodisiac for China, the pearl-oyster shell and tortoise-shell. The two first might probably be cultivated like our own oyster-fishery, the latter is nearly extinct. Arrow-root and cocoa-nut oil might be had in small quantities, but would not pay as yet. Of the larger islands in the Western Pacific, we know little; their capabilities are quite undeveloped, and are now only being awakened. Thus there can be no commerce at any time in the open ocean, except that to be made in its western part; but its boundaries are open to all the world, and Englishmen will not be backward in availing themselves of it. One branch alone is American, or scarcely can be called American, as it is only a small section of New Englanders, who so vigorously and exclusively pursue the whale fishery, and bring immense wealth annually to their country. But they were almost exclusively whale-hunters in the Atlantic, and seem to have distanced all competitors, even of their own nation. That many new sources of profitable enterprise will be opened, there cannot be the slightest doubt; and the present greatly increased and increasing importance of our oriental commerce, of our Australian emigration, and the progress of civilization on the western shores of America, imperatively demand that this long-required inter-oceanic canal should forthwith exist; and it was considered that it was especially the province of the Society to discuss the merits of this important question, bearing as it does upon the arts, manufactures, and commerce of our own country.

In the discussion which ensued, Mr. Doull observed, in reference to levels, that when the Ordnance surveys of Ireland were made, the level of low-water was taken as the datum; but when they came over to England, they found, from Liverpool to the Bristol Channel, there was a difference of about 30 or 40 feet. This was accounted for by the difference in the lift of the tide, and it became evident that low-water could not be regarded as furnishing a proper datum: the mean of high and low tides was found, however, to be correct throughout the kingdom. He had no doubt this was the case in the Pacific and Atlantic, and that the difference might be accounted for by the difference in the lift of the tides. In regard to the canal, he thought it was quite clear that they had no data of any service for engineering purposes, and it would be idle to form an estimate with their present meagre information; they could not say whether it would cost 10,000,000*l.* or 15,000,000*l.*, or 4,000,000*l.* or 5,900,000*l.*; and any project in the absence of accurate data must fall to the ground. He believed, however, if the canal were once properly made, it must become, of necessity, one of the noblest highways of commerce. In reading history, every one must have seen that many nations which had been raised by commerce fell by losing it. England was

still in the vigour of its youth, yet it was just the time to lay hold of the highways of commerce, of which he might mention two as being of the greatest importance; namely, the construction of a line of railway across the North American Continent, colonizing as they went along, and opening out the vast fields of mineral wealth known to exist in that territory; and the other was, connecting the Atlantic and Pacific Oceans by a ship canal.

Mr. Trelawney Saunders wished to add a remark as to the tides. They were generally now considered as a promulgation of the wave from the south, and were highest on shores exposed to the south wind. At Wicklow there was no tide, whereas opposite, in the Bristol Channel, the tide rose to a height of 60 feet.

The Chairman remarked that some time ago the American Government consulted our Government and the Royal Society as to entering into some deep-sea soundings and examinations of the tides. He regretted that it was very coldly received by our Government, and now remained in abeyance. In regard to great circle sailing, he thought much more mystery had been attached to it than was necessary; it was quite clear that the shortest distance between two points on a plane was a straight line, but the shortest distance on a sphere was a great circle. He concluded by proposing a vote of thanks to Mr. Findlay, which was agreed to.

THE TRADES OF BIRMINGHAM.

The price of copper has undergone a change during this week, which will prove of great service to hundreds of small manufacturers and their dependents, who have been unable to carry on their trade in consequence of the recent high prices. On Wednesday last, circulars were issued from the leading houses in the metal trade, announcing a reduction of one penny in the pound, and fixing the quotations at from £108 to £111 per ton. At these prices there is a good supply in the market, and there is reason to believe that many extensive orders for manufactured goods, which have been held back during the last three months, will now be given out.

The general trades of the town and neighbourhood continue to be extremely brisk. The electro-plate and Britannia metal businesses are at the present time exceedingly good, and many of the establishments of the town are working overtime. In Kidderminster the carpet trade is thriving, so much so, that the operative weavers, like the mechanics of other trades, are seeking, and, in some instances, have obtained, an advance of wages. The same may be said with regard to the watch trade of Coventry. The demand for watches required for the Australian market is said to be greater than ever, and, at the same time, in consequence of emigration, and on account of the activity of the trade in other places, good workmen are becoming exceedingly scarce. At Redditch, the needle manufacture, which gives employment to some thousands of hands, is extraordinarily brisk.

At the furnaces and forges some large orders for rails for America are being executed, in addition to contracts for railway iron for use in this country, and iron work for carriages and trucks for new companies in India. Within the last twelve months several thousand tons have been forwarded to the above destination, where the carriage-works are put together, and the wheels, breaks, axles, hinges, &c., fastened, and the work completed.

The manufacture of steam-engines and boilers for maritime purposes, still engages the Birmingham foundries, and there is every probability that, from recent experiments made upon canals in Lancashire, steam-power will be adopted for the transit of goods, and an additional stimulus given to this branch. The experiments alluded to were made by Mr. Caird, general manager of the Ince-hall Coal and Canal Company. These were suggested by the frequent and serious delays in the carriage of the coal raised by the above Company. The steamer used for the occasion was the *Conqueror*, belonging to Mr. Inshaw, mechanical engineer of Birmingham, who, with his son, superintended the working of the vessel. The *Conqueror* towed with ease four loaded coal-boats, containing 40 tons each, at the rate of 2½ miles per hour, a speed as high as is required for canal traffic. The steamer is propelled by two screws, one on each side of the rudder, working right and left, and thus the surge, which each screw of necessity makes, is negatived by the action of its fellow. The cost of horse-haulage from Wigan to Liverpool is 10½d., by steam 4½d., or a saving of 6d. per ton. The experiment was, in every respect, satisfactory, and there is little doubt Mr. Inshaw's boats will be adopted, and that he will receive many orders for canal companies in England as well as Ireland, where his engines have been worked on the Grand Canal with success.

There is one trade, however, which now forms an exception to the general prosperity, that of the Ordnance gunmakers. There is hardly a stock in the shops of the stockers, and the men are consequently idle, although there must be materials for many thousand guns in the stores.

THE IRON TRADE.

The statements made with respect to the iron trade are contradictory, but balancing the events of the last few weeks, and the reports of those interested and best informed in the trade, it may be said to be, as compared with what it was a few weeks ago, dull, with a tendency towards a decline.

The pig-trade, notwithstanding the recent drop, and the fears entertained of a special inundation from speculators' stocks, is represented to be a shade firmer. The first-rate houses, we are told, will not sell good hot-blast pigs made from the mine for much less than £4 10s. Inferior qualities have been sold for £4, and perhaps less. Derbyshire pigs have been offered to parties in this neighbourhood at £3 10s., delivered; but, when their quality is taken into consideration, such quotations will not operate prejudicially on the South Staffordshire and Shropshire markets. The demand for sheets, plates, and rails is steady, and labour in the iron-manufacture continues in request. The chief drawback to this favourable representation of the staple trade of the district is, the very depressed state of the cut-nail business. It is presumed that the chief cause is northern rivalry, for otherwise, considering the extent to which building operations are now carried on in all parts of the kingdom, and the immense amount of these articles exported, the cut-nail business of South Staffordshire and East Worcestershire must have been in a most thriving condition. Nail-rods have been sold during the week in the iron districts at £8 10s. per ton.

Glasgow Pig-iron Market.—Glasgow, June 4.—We have had rather an irregular market for pig-iron this week. From the opening on Monday till Thursday a steady feeling prevailed, the price advancing to 53s. 6d., but the Bank raising the rate of discount, caused a reaction, which has been further accelerated by the rumours of war in Turkey, and 52s. cash was to-day accepted for warrants. We close, however, rather firmer, sellers demanding 52s. 6d., which has been paid. No. 1., 54s.

America.—By the United States mail steamer *Baillie*, which arrived at Liverpool on Tuesday, with advices from New York to the 28th ult., we learn that Scotch pig-iron was inactive. Two cargoes of wrought scrap-iron, to arrive, had been sold at 37 dollars, six months.

THE CALORIC SHIP "ERICSSON."

The American news received by this week's mail, furnished the following statement written by Captain Ericsson himself to a New York paper, apparently in answer to a request that he would describe the present condition of the *Ericsson*, what repairs in, or additions to, her machinery were being made, and when she would probably be ready for sea. Captain Ericsson says:

"I cheerfully comply with your suggestion in regard to the caloric ship. I have much pleasure in assuring you that nothing whatever has occurred in working the machinery indicating the difficulties that can prevent the successful realization of this important enterprise. The only difficulty we have met with is that of the cylinder bottoms or heaters having proved too elastic and yielding to remain air-tight, or to admit of full pressure being carried. On the return of the ship from the South, two months ago, it was deemed advisable to replace these heaters, which are made of boiler-plate, by others of cast iron, as that material admits of being made of any required thickness. Only one foundry having been found willing to undertake the casting of these, requiring from six to eight months for their completion, we have been compelled to adopt a different plan; one, however, that will insure increased power and speed. As the modification which this involves calls for work of great magnitude, our friends will have to exercise some little patience. Allow me, in connection with this remark, to remind you that it is only thirteen months since the keel of the caloric ship was laid, and that steam ships of her class usually require eighteen months for completion. Mr. Collins, in building his ships, found nearly twice that time requisite. As the modification of a patented machine is not properly a subject for public discussion until completed, you will, I am sure, see the propriety of my not furnishing a statement of what is now being done to the machinery of the caloric ship. As soon as the work is completed, the owners of this ship will be most happy to invite the intelligent and liberal press of New York to see the result of the second step in the development of the great motor."

SUBMERSION OF THE DUTCH TELEGRAPHIC CABLE.

Electric telegraph communication between England and Holland has been successfully accomplished, the cable having been submerged from Orfordness, on the coast of Suffolk, to Scheveuing, on the Dutch coast, a distance, in a straight line, of 115 miles. The engineering arrangements for the purpose were under the superintendence of Mr. Edwin Clark, engineer in chief to the Electric Tele-

graphic Company, assisted by Mr. F. C. Webb; and the expedition was under the command of Lieut. Burstall, R. N. Three vessels were engaged in the operation,—the *Monarch*, paddle-steamer, 540 tons (a vessel purchased by the Company for carrying out this and other submarine undertakings in contemplation), having on board the cable, 180 miles in length, and 300 tons in weight; the *Goliath*, steam-tug, in attendance, as a precaution, in case of any casualty to the engines of the *Monarch*; and the *Adder*, Government steamer, which was kindly lent by the Admiralty, to assist in this national enterprise.

The course having been previously buoyed by Lieutenant Burstall in the *Adder*, the squadron left Orfordness at nine A.M., Monday week, the weather being in every way propitious, and the operation was conducted without the slightest difficulty, and a constant communication kept up with the English shore. About nine P.M., however, the barometer suddenly fell one-tenth of an inch, and as suddenly rose again; about midnight the wind increased to a fresh gale from the north-east, with a heavy sea; and although messages from the English coast announced perfectly fine weather, it was afterwards discovered that it was at the same time blowing a gale on the Dutch coast. The *Monarch*, loaded as she was with a dead weight so near her keel, rolled to an alarming extent, and great fears were entertained for the safety of the funnel, the chains of which parted. The "cable-break" began also to tear itself from the deck from the working of the vessel. These defects were, however, speedily remedied, though Mr. Spencer, who had charge of the "break," was lashed to his post, which he never quitted during the operation.

The difficulty of uncoiling the cable became exceedingly formidable, and almost baffled the perseverance and determination of the men engaged in that duty, who belonged to the establishment of Messrs. Newall, the manufacturers of the cable. During the day the buoys were successfully made without difficulty; but, as night approached, great apprehensions were felt as to the probability of holding a correct course. The *Adder* being always in advance to pilot the *Monarch*, keeping up a communication with the latter by rockets and blue and red lights, was however observed to remain for some time stationary; and on the *Monarch* closing, she called attention, by the hearty cheers of her crew, to the position of the buoy, barely visible through the darkness under her larboard bow. So closely, indeed, was the direct course followed, that only two buoys, out of fourteen laid down, were missed during the whole voyage. A fresh departure was then taken; and, notwithstanding the darkness of the night, the haze of the morning, the heavy sea, and the numerous difficulties which they had to contend with, the Dutch coast was reached on Tuesday night without accident. On reaching the Dutch coast, the surf was so heavy on the beach that it was impossible to effect a landing. An attempt was, however, made on Wednesday, but it was not until early on Thursday that the end of the cable was brought on shore.

Communications between the Hague and England were effected for the first time a 9:15 A.M., and messages were immediately sent from England to the King of Holland, and from Sir Ralph Abercrombie, British minister at the Hague, to the Earl of Clarendon; and numerous other official communications took place throughout the day.

The steering of the *Monarch* was successfully managed by Mr. Webb, assisted by Mr. Sargeant, boatswain to the *Adder*, while the management of the communication with England, and the constant testing of the cable at intervals of 30 seconds, was ably conducted by Mr. Latimer Clark. The secretary of the Electric Telegraph Company was present on board the *Monarch*; Mr. Newall and Mr. Statham, of the Gutta Percha Company, were also anxious to have been present, but arrived, unfortunately, too late at Orfordness; and after a short telegraphic conversation with the squadron, which was then about 30 miles from the coast, returned to London.

The *Monarch* proved herself a thoroughly good sea-going boat, especially adapted for the purpose, and is the first steamer which accomplished such an operation without the assistance of a tug. Whether we consider the unusual length of the voyage,—nearly double any which has hitherto been attempted,—the unprecedented occurrence of so heavy a gale, or the inhospitable nature of the coast, the operation certainly ranks as the most bold and successful hitherto chronicled in the annals of telegraphic engineering.

IRON ROOFS OF LARGE SPAN.

(From a paper by Mr. Robert H. Bow, C.E., of Edinburgh, read at the Royal Scottish Society of Arts.)

After some introductory remarks, and insisting upon the propriety of employing roofs of great clear span for principal railway stations, the author institutes a comparison between the different classes of

structures employed for the principals of roofs; and deduces that the *triangular frame* (in which the rafters constitute the main compressed member of the fabric) deserves to be preferred before all arched, compound, or other forms, when an inclined surface is demanded by the covering, of the character required for slating. And he further shows, that where untied or abutting principals can be used, rafters, when made straight and treated as bridges, form principals of a very economical character; but that, for such a situation, rigid arched structures are quite inadmissible.

He arranges those straight-raftered principals in which the rafters are the main compressed members, into two classes; the first class embracing those which are tied, or exert only vertical pressures on the supports; and the second, those which are untied or of the abutting character. The principals of the tied class are of two kinds; in the principals of the first variety each rafter acts as a bridge; but the principals of the second partake of the nature of a framed girder. The designs proposed by Mr. Bow, are of the former variety—that is, each rafter is treated as a bridge, and they may therefore be employed either in the tied or untied state. In order to test their merits as suitable forms for long spans, they are compared with the best form at present in use for long spans, and which is of the latter or girder character.

In the calculations undertaken in order to make the comparisons, the weight of each part is represented by the product of the successive multiplication of its length by its strain, and the allowance of metal per ton of strain. For *ties*, the sectional area of metal is estimated at one-eighth of a square inch; for *rafters*, at a quarter of a square inch; and for the *struts* of the bracing at half a square inch for each ton of strain.

The accompanying Tables give the results of his calculations. In these, however, the effect of that source of economy of material which arises from the peculiar fitness of the proposed forms for cases requiring many supported points, is alone made evident. But if the strains in the struts of the several forms be compared, it will be found that the strains in the best form now in use are relatively less than as the squares of the lengths; and, consequently, the allowance of metal per unit of strain should be greater for the struts of that form than would be necessary for the struts of those proposed by Mr. Bow. And therefore were that fact taken into account in the comparison, results would be arrived at still more favourable to the new forms than those displayed in the Tables.

Comparative Weights of the Principals, Nos. 1, 2, and 3.

First Case.—When the Sections of the Rafters are proportioned to the Strains.

No. 1 refers to the best form now in use, and Nos. 2 and 3 to two forms proposed by Mr. Bow.

No.	$N=16$	$N=20$	$N=24$
1 ..	100·000 ..	100·000 ..	100·000
2 ..	97·325 ..	94·760 ..	91·117
3 ..	99·674 ..	—— ..	92·120

Second Case.—When the Section of the Rafter is uniform.

No.	$N=16$	$N=20$	$N=24$
1 ..	100·000 ..	100·000 ..	100·000
2 ..	89·882 ..	88·387 ..	85·796
3 ..	89·353 ..	—— ..	83·898

N = number of Bays in the Span.

Comparative Weights of the Principals, Nos. 1, 2, and 3, when Nos. 2 and 3 are not tied.

No.	First Case.	Second Case.
1	100·000	100·000
2	75·690	71·176
3	78·046	70·653

Number of Bays in Span = 16.

STEAM ON THE LEEDS AND LIVERPOOL CANAL.

We take from the June number of the *Artizan*, the following account of the trial of the *Conqueror*, on the Leeds and Liverpool Canal, to which reference is made in another page under the head "Trades of Birmingham." The Editor of the *Artizan* observes in a note appended to this description, that an arrangement similar to it has been used for many years on the American canals by Captain Ericsson:

Mr. W. Laird, general manager of the Ince-hall Coal Company, has put himself in communication with the Directors of the Leeds and Liverpool Canal, for the purpose of adapting steam to the present system of boat towing on canals or rivers; and on Saturday an experiment was successfully tried on the above canal. The steamer used on the occasion was the *Conqueror*, belonging to Mr. Inshaw, of Birmingham, who, with his son, superintended its working. That portion of the canal on which the trial was made is very favourable for the introduction of steam-haulage—the distance from Wigan to Liverpool being thirty-six miles, with only one lock at Appleby, five miles from Wigan, to which it is proposed

to continue horse-haulage; but from thence to Liverpool, thirty miles of uninterrupted level, to use steam. On Saturday, the *Conqueror* towed with ease four loaded coal-boats, containing forty tons each, at the rate of two miles and a half per hour—a speed as high as is required for coal traffic—though she is a passenger boat of only six horses' power, built for lighter work and a greater speed. The boat is propelled by two screws, one on each side of the rudder; these screws work right and left—a peculiarity of construction first applied to canal steamers by Mr. Inshaw—and thus the surge which each screw of necessity makes is negatived by the action of its fellow. Hence the swell on the banks of the canal did not exceed, even if it reached, that caused by horse-towing. The practical result of the experiment may be thus stated:—The present cost of haulage of 40 tons of coals by *horse power* from Wigan to Liverpool is 35s. 6d. or, per ton, 10½d. By *steam power* the towing-boat would be one of the ordinary canal boats, carrying an engine and boiler of 12-horse power, the weight of which would not exceed five tons, leaving space for stowage of a cargo of coals weighing 35 tons, four boats following, carrying 40 tons each,—160 tons: total, 195 tons. Allowing three days for going to and from the colliery, 36 miles there and 36 miles back, or 72 miles altogether, in as many hours, the boats would make two trips per week, instead of two trips in three weeks, as at present, and would deliver in Liverpool weekly 390 tons. The weekly expenses would be as follow:

Ten per cent. as cost of engine, and fitting same in one of present canal boats, say £300, is per annum £30, or weekly......	£0	12	0
Engineer's wages	1	10	0
Fireman's wages	1	0	0
Two steersmen's wages, at 15s..	1	10	0
Fuel, at rate of one ton, or 5s. per day	1	10	0
Oil, waste, and repairs.........	0	10	0
Expense of hauling by horses, boats, &c., between Wigan and Appleby Lock, six miles, at 1s. per mile, or 6s. two journeys .	0	12	0
Total weekly expenses ..	£7	4	0

incurred in delivery of 390 tons of coal; being equal to the rate of 4⅘d. per ton.

The cost of horse haulage per ton being........	10½d.
The steam haulage ..	4½d.
The saving is	6d. per ton.

But this is not the only saving, as Mr. Laird proposed the application of a drum to the engine to make the boat engine discharge, by the assistance of cranes, each of the boat's cargoes into the yards, or into ships at Liverpool, thus effecting a further saving in terminal expenses. The importance to the Ince-hall Company of possessing a full control over their traffic may be estimated from the following statistics:—The annual vend of coal is between 300,000 and 400,000 tons; and they pay to railway and canal companies for haulage and tolls between 30,000*l.* and 40,000*l.* per annum. They even send coal into Staffordshire for house consumption; while the importers of coal at the seaports in the United States, after paying 30 per cent. duty, find the Ince-hall cannel the cheapest article they can procure for the manufacture of gas. The experiment was considered so far satisfactory, that Mr. Inshaw was desired to place himself and his boat at the disposal of the Directors of the Canal Company, with the view of trying further experiments in the course of the following week.

[An arrangement similar to the above has been used for many years on the American canals by Captain Ericsson.—Ed.]

ROSENKILDE'S PATENT WINDOW-SASH SPRING.

A spring of an extremely simple character, intended to be applied to window-sashes, has been invented by Mr. Christopher Garman Rosenkilde, who has deposited his provisional specification with a view of securing a patent right for the article. By the use of Mr. Rosenkilde's spring, weights, lines, pulleys, and fastenings will be dispensed with at once, and the following advantages will be gained:

When the sash is down, the window is fastened and perfectly secure from the outside. It will of itself secure the safety of children left alone in a room; as a child of four or five years of age, not being able to force the spring back, and at the same time lift up the sash, cannot fall out of the window. It may likewise be the means of preserving the lives and limbs of grown persons when employed in cleaning the windows on the outside, as the beads may, with very little trouble, and without injuring either frame or paint, be unscrewed, and the sash taken into the room to be cleaned. If the sash be made to fit tightly into the frame, it will work up and down very easily, and at the same time prevent the admission of draft and dust into the rooms. The expense of fitting windows with this spring will be considerably less than what the present fittings cost; and the labour or workmanship incidental to the manufacture of the

frame will be much less, as the boxes for the weights and lines are done away with. The lines now used often break, and to have them repaired it is necessary to undo the boxes, whereby the frames become so damaged that frequently they must be painted over again. This inconvenience will be put a stop to by Mr. Rosenkilde's spring, as it is estimated that the repairs of this spring would not exceed 1s. in twelve years.

A Series of Tables of the Area and Circumference of Circles, the Solidity and Superficies of Spheres, the Area and Diagonal of Squares, Specific Gravities, &c. By Charles Todd, C.E. Second edition. Longman and Co.

The utility of copious and accurate Tables of the geometrical quantities included in the title of this work will have been fully recognised by all who have much occasion to make calculations of general work, or of details of construction in almost every mechanical occupation. In the absence of such means, approximative methods are very frequently resorted to, which, partly from the difficulty of bearing in mind the constants of the calculation to a sufficient number of places of decimals, and partly from an inaptitude for figures not uncommon even among well-skilled mechanics, oblige the artisan to remain content with results rather remote from the degree of accuracy usually desirable in practice. When a simple reference to a table will enable him to find, by inspection, the length, area, or solidity of the circular or spherical bodies he is dealing with, accurately to four or six places of decimals, it cannot be doubted that he would readily abandon his own laborious and unsatisfactory process, for the prompt, simple, and accurate assistance which this book would confer upon him. Having himself been engaged very largely in a business requiring assistance of this description, he has been the better prepared to tabulate the quantities in the most convenient form, to meet the wants of the workman. The plan of the work is therefore excellent, and the typography amply seconds his efforts to render it as accessible to the understanding as could be desired. We may observe, in passing, that the labour of calculation has been much lessened, without sacrificing accuracy in the least degree, by the method of computation which the author has employed. He describes his method at considerable length in the preface; but our mathematical readers will understand it immediately, when they are told that the principle applied is that of the method of differences, the differences becoming constant in the second order for areas, and in the third for solidities. So far as we have examined them, we are able to say that the tables are rigidly correct, and worthy of confidence. The gradations in the several tables are more or less minute, according to the magnitude of the class of diameters included in each table; and the specific gravity tables include the metals, earths, stones, resins, gums, woods, liquids, and gases, all in great numbers, stating the weight of a cubic foot of each in ounces and pounds, the weight of a cubic inch in ounces, and the number of cubic inches and feet in a pound.

The Cyclopædia of Useful Arts. Edited by Charles Tomlinson. Part XXXII. George Virtue.

The excellent article on printing, to which we alluded in our notice of the thirty-first Part of this valuable work, is brought to a conclusion in the present one, and made to comprehend those subdivisions of the art in which colouring, engraving, and their incidental operations, form a part of the work. After completing the description of stereotyping, separate sections are devoted to the art of printing in colours and in gold, and to copper-plate and lithographic printing,—the latter including an account, with a figure, of the bank-note numbering machine, invented by Oldham, which has excited so much interest by its accurate automatic action. We find, also, a very substantial and highly interesting article on the new subject of galvanoglyphy, with a notice of some of the works of the Imperial Printing-office at Vienna, executed by this process, and much admired in the Great Exhibition. Mr. Palmer's galvanoglyphy, Piil's chemityphy, Gillot's paneiconography, and the anastatic printing process, are also described here, and their relative powers and susceptibility of application to various objects clearly defined. With these notices of the most recent additions to the art of printing, ends the exposition of that great and comprehensive subject, the treatment of which has been eminently successful, and may be taken as a remarkable illustration of the general excellence of the book in a popular point of view, and, to some extent, also, in a practical one. The manufacture of Prussian Blue and of Prussic Acid are also gone

into at considerable length, historically, chemically, and practically, and the details of each branch of the subject will be read with much interest. The important article "Pump" is very fully and very elaborately treated of. An ample account will be found by our mechanical readers of the expedients resorted to in ancient times and in distant countries for raising water. The structure of the common pump and of the forcing pump is illustrated by engravings, and the best conditions of construction and working are pointed out. Engravings are also given of the several kinds of valves, with an explanation of their applications. The structure of the pumps employed for raising the drainage-water of mines is also illustrated by a fine sectional engraving of the shaft, pumps, pistons, and cisterns. The famous machine of Marly, for supplying Versailles with water from the Seine, 500 feet below their level, which was a great engineering effort at the period of their construction, forms not an unprominent part in this article, which is replete with features which the mechanical reader will be certain to appreciate. At this portion of the subject the general mathematical conditions of this description of machinery are explained in a clear and popular manner, likely to be important to the machinist who is not fully conversant with the rules of practice which science and experiment have furnished. A great number of modern pumps, the patents of many of which come down to recent years, and as late as 1851, form the subject of the remainder of the article, and of its illustrations. Appold's and Gwynne's centrifugal pumps are included in the number. Their principle and operation are fully explained and described by figures, and an account of the performances of these machines is added. The article "Punch—Punching-machine" also receives a great attention, and is illustrated by figures. Rain-gauge is another article well worth attention, as is also that on raised works in metal. The next important article we come to, and which is only in part treated of in the present Part, is on the subject of roads and railroads. An ample historical sketch of road communication is given at the commencement, and then the article proceeds at once to the practical details. The illustrations are extremely numerous, and include the principal engineering and operative details of that portion of the subject which relates to common roads. Upon the whole, the thirty-second Part will be found to maintain the high reputation of the work, of which, as it advances to its completion, we become more and more sensible of the value it possesses; as a pleasing one for popular study, for occasional reference, or for the instruction of the young with reference to future mechanical or scientific occupations.

CHEMICAL GOLD-WASHING.

The following extract from the correspondence of the *Alta California* describes a method of obtaining gold, by simple means, from a material which appears to be easily procurable, and which is well worthy of attention. "My nearest neighbour is a high German doctor, deeply skilled in all the mysteries of the Rosicrucians, the Ethiopians, and the High Fantods. Though he does not lay claim to having discovered the philosopher's stone, he has certainly found a golden egg in the nest of the alchemist. His way is, to buy up of the miners the black sand which they have been accustomed to throw away, and, by a skilful combination of acids, to dissolve the gold in it in a state too fine to be saved by any other process. By this means he is able to find gold not otherwise discoverable, and in his experiments he finds a great deal to confirm what I said in a previous letter in relation to the existence in the ground of an immense amount of gold in an impalpably fine powder. With the aid of acids, he is enabled to obtain every particle of gold; for the finer it is, the more readily it is dissolved by the acids, after which it is precipitated. He tells me, that by this process he can not only find gold in the sand, but in a great deal of the common earth, which will not give 'the colour' by any means of washing. It is true that it is generally in very small quantities, not enough to pay, unless it is in rare locations; yet the fact is not the less proved that gold in the finest powder is diffused throughout the soil; and the question arises, how can it be saved most effectually? It will probably never pay to save it by a chemical process, for the cost of acids is so great that the sand must be rich indeed to make it a profitable business at this time. The most that can ever be done, as it seems to me, is to improve on the sluice-washing—to have abundance of clear water, and have the sluices very long, and towards the lower end very wide, so that the water should spread out in a very thin sheet, and underneath this to have a cloth lining on the bottom, so that the fine particles would be forced into the interstices, and there remain till it might be advisable to take up the cloth and wash the fine gold from it. Though I lay no claim to mechanical ingenuity, I can see clearly enough that there is room for improvement in the matter of gold-washing. It may be that other parts of the State are in advance of

this; and as it is a subject of vast practical importance, I hope to see others, more competent, give the subject the attention it deserves."

LAUNCH OF THE "CARLO ALBERTO," AT NEWCASTLE.

The war frigate *Carlo Alberto*, destined for the naval service of the Sardinian Government, to whose order she was constructed, by Messrs. T. and W. Smith, of St. Peter's Quay, Newcastle, was launched on Monday the 23rd ult., from the slips of that firm, in the presence of an immense concourse of spectators. She is a vessel of fine proportions, her dimensions being as follow:—

	Feet.
Length extreme	247
Length between perpendiculars ..	215
Breadth extreme	50
Extreme depth of hold	32

Burden, according to the builder's measurement, 2,500 tons. She is fitted with an auxiliary two-bladed screw, weighing 8½ tons, of brass, and driven by two engines of 400-horse power, manufactured by Messrs. Stephenson and Co., of this town. She is copper-fastened throughout, and will be sheathed with copper to the binns. She has three decks, and the uppermost two will mount an armament of 50 guns, viz.:—

Upper deck,	20 guns,	32-pounders,	8 ft. 0 in.	long.
"	1 gun,	68-pounder,	10 ft. 6 in.	"
Main deck,	16 guns,	32-pounders,	9 ft. 6 in.	"
—	14 guns,	68-pounders,	9 ft. 0 in.	"

The lower deck is not yet laid, nor are her cabin fittings commenced internally, so that, in fact, she at present is a mere shell; yet such is her magnitude and weight that she draws upwards of 17 feet water.

The launch took place a few minutes after five o'clock; and the ebb had then commenced, the water having fallen nearly 6 inches. She quitted the stocks in excellent style, but her momentum through the water after leaving the slipway brought too heavy a strain upon the check-warps, which snapped in consequence. Her waste anchor, weighing upwards of 37 cwt., failed to bring her up, and she grounded with her heel on the south shore. Nine powerful steamers were attached to her, but their united efforts failed to bring her off, for as the tide receded, the firmer she settled down upon the foreshore, or rather bed of the river; for she was within low-water mark, and to an ordinary observer would seem hanging rather to the north side, which, however, forms a concave shore in proximity to the deep water; the sloping shoal being southward, and opposite the dockyard. The *Carlo Alberto* is perhaps the strongest ship ever built as a man-of-war. The bow is ornamented with a beautifully-carved bust of Charles Albert, King of Sardinia. Her keel was laid in August, 1852, and she has been built under the inspection of M. Vianson, who was present at the launch.

Extensive arrangements were made by the Messrs. Smith for the accommodation of visitors. The ceremony of naming the vessel was performed by Mrs. John Biggs, from a platform at the stem, amid a salute of cannon and the cheers of assembled thousands. A large party partook of wine and other refreshments in the model-room after the launch.

On the rising of the tide on Tuesday morning, the *Carlo Alberto* was floated into deep water, without having sustained any damage. She has not made a drop of water, and she has broken her shear only one-eighth of an inch. She draws 17 feet water aft, and 12 feet 5 inches forward, and she is now lying in the deep water at Dent's Hole, near St. Peter's Quay, preparatory to her being taken down the river to be docked by the Messrs. Smith at North Shields, where she will receive her engines and complete her equipment for sea. Six steamers were engaged to tow her down the river on Wednesday afternoon.

SECOND TRIAL TRIP OF THE "DUKE OF WELLINGTON."

The *Duke of Wellington* screw steamship, of 131 guns, got up her steam in Portsmouth Harbour on Tuesday last, for the purpose of going down to Stokes' Bay on a second trial trip. In the interval which has elapsed since her first trial-trip on the 12th of April, this fine vessel has received her fit-out, and the occasion was consequently one of great interest.

High water occurred at about 10 minutes to 12 o'clock, and some speculation was indulged in as to whether there would be a sufficiency of water on the bar outside the harbour to enable her to cross it in safety.

At a quarter to 12 o'clock the ship was under weigh, but as she neared the bar, which is situate between Hollingsworth's Rooms and Southsea Castle, right across the harbour channel, deep interest, if not anxiety, began to be felt by the thousands of spectators on the shore, as to whether she would quite clear it. The speed of the ship was diminished, and the utmost attention was paid to the reports of the leadsmen on both sides of the vessel. Every throw

of the lead produced a diminished depth of water, till at length their reports showed that there was only a space of 1¼ to 2 inches between the after part of the keel and the bar. The suspense as to what the next throw of the lead would indicate was, at least on the part of the non-professional persons present, greatly relieved by its showing an increase in place of a decrease of water, and in a few minutes an ample depth was obtained, and all danger was at an end. Full power was then put on, when it became obvious that although the ship was much deeper in the water than on her previous trial, she was nevertheless going at a very high speed. At her first trial she had no guns on board, but now she had the whole of her main and middle deck guns on board, besides 22 of her lower-deck guns; these latter were placed forward to bring her down by the head. The total number of guns on board was 97. She had also a large quantity of ship stores, provisions, &c., on board to-day, besides her crew of officers and men, at present amounting to 840.

The *Duke of Wellington* then made two runs in Stoke's Bay, the results of which were as follow:—

	Time.	Revolutions of Engines.	Speed in knots per hour.	Average speed.
	M. S.			
First run, with tide ..	5 16	32	11·392	9·902
Second run, against tide	7 9	32	8·413	

On her first trial, she realised the following results:

Runs.	Revolutions.	Time.	Knots per hour.	Average of knots per hour.	Mean.
		M. S.			
First	29	5 43	10·495	10·022	10·031
Second	30	6 15	9·057		
Third	29½	5 28	10·975	10·187	
Fourth......	31	6 23	9·399		
Fifth	29	5 23	11·145	10·100	
Sixth	29	6 37	9·068		

The pressure of steam was nominally 15 lbs., but in reality the engines could not be worked beyond a pressure of 8 lbs. to 10 lbs., owing to the boilers being too small. On Tuesday. the ship's draught of water was 25 feet 10 inches; on her first trial it was 24 feet 3 inches. The difference between the averages of the runs made to-day and those made at her previous going out showed a difference of about three-tenths of a knot in favour of the latter. After the two runs, the ship was put through several evolutions, exercising her expansion-gear, turning round in a circle, backing astern, &c., all of which she performed satisfactorily. The shake of the vessel to-day was apparently much less than on the previous trials, owing no doubt to her being deeper in the water, and consequently steadier. The *Duke of Wellington* remains at Spithead.

THE LORD MAYOR'S CONVERSAZIONE.

DURING the past week, the Mansion-house has been the scene of a new species of civic entertainment, having for its object the promotion of science and art, by increasing facilities for education and study. On Wednesday a conference took place with the mayors of about eighty provincial towns, who had been invited by his Lordship to consider the subject, and in the evening an assemblage of not fewer than 1,000 individuals, comprising all the distinguished personages who in recent times have taken part in the advancement of education, was received by him. To find the

chief magistrate of London thus active in the promotion of so humanizing a scheme, is a circumstance upon which every true friend of human progress must congratulate himself, and we refer to it with pleasure as another illustration of the improving prospects of our industrial population.

The great question discussed at the conference, appears to have been the extent to which education in science and art can be grafted upon the present system of education, as pursued in our public or national schools. The Mayor of Liverpool took a distinguished part in the discussion, and was the first to state, which he did in forcible language, what had been done in the town of Liverpool with this object in view. The Lord-Provost of Glasgow, the Lord-Provost of Edinburgh, the Lord Mayor of Dublin, the Mayor of Hull, the Mayor of Newcastle, the Mayor of Chester, the Mayor of Leicester, the Mayor of Norwich, and others, also vindicated the educational progress which their respective fellow-townsmen had accomplished, and spoke in confident terms of the improvement which had already resulted, and of that which would result, were a vigorous and systematic effort made for the general cultivation of art and science, but on a self-supporting system. Dr. Lyon Playfair and Mr. Cole expressed strong opinions in favour of the voluntary system in education, as opposed to a compulsory system, and pointed to several remarkable examples in support of this view. It is right to explain that this movement, originating with a cry for institutions here like those abroad, dedicated to industrial instruction, has now been so far modified that its most distinct and positive feature is simply ingrafting upon the present system of primary education tuition in the elementary principles of art and science.

The discussion ultimately assumed something of a desultory character, but on the whole the object of the Lord Mayor was satisfactorily attained by the union of so many influential persons in the common purpose of improving the instruction of the people; and it cannot be denied that the magistrates of our great towns are assuming a new and highly laudable position in the eyes of the public, whilst associating themselves with such a cause.

The evening's *conversazione* went off with great *éclât*, and seldom, indeed, have the rooms of the Mansion-house been more appropriately and worthily filled. Besides his civic brethren from the country, the Lord Mayor had assembled around him all the most eminent names in connection with the subject of education, and with art and science generally. The 270 mechanics' literary and scientific institutions in union with the Society of Arts sent up their representatives, and those gentlemen were invited to the Mansion-house. The rooms of the Mansion-house were furnished, for the occasion, with a large and highly interesting collection of scientific and philosophical apparatus of every kind, brought together through the instrumentality of the Society of Arts. The principal publishers of educational works sent in their publications, and some beautiful models, diagrams, and specimens of apparatus, remarkable for their cheapness and general excellence, were shown by the new Department of Science and Art. The crowds of visitors left scanty opportunity for the careful and leisurely examination of these objects; but they contributed much to give effect to the practical aim of the worshipful host, which we sincerely trust will be crowned with the most complete success.

PROVISIONAL PROTECTIONS.

Dated April 27, 1853.

1011. James Dinning, of Southampton. Certain improvements in wash-stands and baths, part of which improvements are also applicable to table fountains.

Dated May 2, 1853.

1056. James Greenwood, of New Accrington. An improvement in fixing mordants on fabrics.

Dated May 4, 1853.

1086. Cornelius Alfred Jaquin, of Monkwell-street, London, button-manufacturer. Improvements in the manufacture of covered buttons made by dies and pressure.

Dated May 6, 1853.

1121. Christopher Nickels, of York-road, Lambeth. Surrey. Improvements in machinery for masticating, kneading, or grinding India-rubber, gutta percha, and other matters.

1122. William Longmaid and John Longmaid, of Beaumont-square, Middlesex. Improvements in treating waste products obtained in smelting and otherwise treating ores and minerals, and in producing a valuable product or products therefrom.

Dated May 13, 1853.

1188. John Knowles, of Manchester, Lancaster, marble merchant, and Edward Taylor Bellhouse, of the same place, engineer. Certain improvements in the manufacture of articles of marble.

Dated May 18, 1853.

1221. Christopher Richard Norris Palmer, of Amwell, Hertford, Esq. An improved mode and apparatus for working the machinery in factories and ships, in connection with the steam engines or steam power now used therein.

1223. Bernard Peard Walker, of Wolverhampton, Stafford, cut-nail manufacturer, and James Warren, of Mile-end-road, Middlesex, gentleman. Improvements in the manufacture of iron.

1225. Charles Clarkson, of Avery-row, Lower Grosvenor-street, Middlesex. An improved duster or dusting-brush, painting-brush, and all other

description of brushes, the handle of which passes through the centre, and the hair or bristles are bound or tied round it.

1227. John Ryan, of Liverpool-street, London, surgeon. An apparatus for purifying liquids in a ready and economical manner.

1229. John Barsham, of Kingston-upon-Thames, Surrey. Improvements in charring peat and other vegetable substances, and in burning lime.

1231. George Sant, of Norton Lodge, Mumbles, Swansea. Improvements in clocks or time-keepers.

1233. John Oakey, of Blackfriars-road, Surrey, emery-manufacturer. Improvements in reducing emery, glass, and other like substances.

1235. Job Allen, of Bower-street, Middlesex, engineer. Improvements in communicating intelligence.

Dated May 19, 1853.

1237. Samuel Wright, of Church-street, Shoreditch, Middlesex. Making a gas, steam, air, or liquid safety-tap.

1238. Thomas Grahame, of Hatton Hall, Wellingborough, Northampton. Improvements in the manufacture of covering materials for houses and other structures and surfaces.

1239. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery or apparatus applicable for pumping water and supplying steam boilers with water, and maintaining the water therein at a proper level. A communication.

1240. John Hippisley, of Stoneaston, Somerset, Esq. Improvements in steam engines suitable for agricultural purposes, and to locomotion on common roads.

1241. John Ames Gilbert, of Clerkenwell, Middlesex, japanner, for the invention of an improvement in canisters.

1242. Joseph Wainwright, of Heap, near Bury, Lancaster, mechanic. Certain improvements in apparatus for regulating or governing the speed of steam engines.

1243. John Thornborrow Manifold, Charles Spencer Lowndes, and John Jordan, Liverpool, Lancaster, engineers. Improvements in the method of extracting the juice from the sugar-cane.

1244. William Fulton, of Paisley, Renfrew, North Britain, bleacher. Improvements in the treatment and scouring or cleansing of textile fabrics.

1245. Charles de Bergue, of Dowgate-hill, London, engineer. Improvements in the permanent way of railways, and also in chairs, and in sleepers for permanent way.

Dated May 20, 1853.

1246. St. Thomas Baker, of King's-road, Chelsea, gas engineer. Improvements in revolving shutters.

1247. Charles Cowper, of Kensington, Middlesex, engineer. Improvements in steam-boilers.

1248. Edward Jones Schollick, of Aldingham Hall, Ulverstone, Esq. Improvements in obtaining motive power.

1249. Samuel Schollick, of Ulverstone, shipbuilder. Improvements in ship-building.

1250. Henry Gilbert, of Kensington, Middlesex, gentleman. Improvements in apparatus for cleaning boots and shoes.

1251. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, Middlesex. Improvements in rotary engines to be driven by steam or any vapour, fluid, or gas, and in boilers or generators to be used in generating steam or gas for driving the aforesaid or other engines, or for other purposes. A communication.

1252. Thomas Isaac Dimsdale, of Kingstown, near Dublin, Esq. Improvements in purifying coal-gas, and in disinfecting sewage or other fetid matters, and in absorbing noxious gaseous exhalations.

1253. Edward Hammond Bentall, of Heybridge, Essex, ironfounder. Improved machinery or apparatus for measuring and indicating the power exerted by engines, and also the force required to propel machinery, carriages, or ploughs.

1254. William Carr Thornton, of Cleckheaton, York, machine-maker. Improved machinery for making wire-cards.

Dated May 21, 1853.

1255. George Carter, of Mottingham, Kent, gentleman. Improvements in the manufacture of fire-lighters, and in machinery connected therewith.

1256. John Blair, of Ducie-Bridge mill, Manchester, Lancaster. The application of steam power to the working of railway breaks.

1257. Joseph Betteley, of Liverpool, Lancaster, anchor-manufacturer. Improvements in anchors.

1259. Louis Gervais Dieudonné Buffet Delmas Ducayla, of Bordeaux, France, Esq. An improved manufacture of artificial fuel. A communication.

1261. George Marriott, of Hull, York, colour-manufacturer. Improvements in the manufacture of fire-lighters.

1262. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, Middlesex. Improvements in navigable vessels to be employed in all waters, and to be propelled or impelled by sails, steam power, or other means. A communication.

Dated May 23, 1853.

1263. Samuel Alfred Carpenter, of Birmingham, Warwick, manufacturer. A new or improved elastic webbing or fabric.

1264. Evan Evans, of Birmingham, Warwick, pattern-maker. An improvement or improvements in casters for furniture.

1265. Adolphe Augustin Girouard, of Paris, France. Certain improvements in paving and generally in covering surfaces with asphaltic and other similar materials.

1266. William Simson, of Edinburgh, Scotland, banker. Improvements in locks.

1267. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, London. An improved method of treating flax and hemp, whereby they are brought to such a state that they may be carded, spun, and woven by machinery, such as is now employed in the manufacture of cotton and wool into yarn and cloth. A communication.

1268. Amédée Devy, of Grosvenor-street, Grosvenor-square, Middlesex. Improvements in storing and preserving grain. A communication.

1269. John Harecourt Browne, of Arthur's Seat, Aberdeen. Improvements in apparatus for bottling or supplying vessels with fluids.

1270. Paul Hannuic and Gustave Collasson, of Rue de la Victoire, Paris. Improvements in the treatment of oil.

1271. Henry Turner, of Wilson-street, Limehouse, engineer. A new mode of applying hydraulic power to windlasses, for weighing anchors and lifting heavy weights.

1272. John Henry Johnson, of Lincoln's Inn-fields, Middlesex, gentleman. An improved forge-hammer. A communication from Jean Schmerber.

1273. John Henry Johnson, of Lincoln's Inn-fields, Middlesex, gentleman. Improvements in the construction of pipe and other junctions. A communication from Messrs. Laforest and Bondeville, of Reims, France.

1274. William James Sloss, of Bethnal-green-road, Middlesex, engineer, George Benjamin Mather, of Derby, gentleman, and Philip Wood, of Stratford, Essex, gentleman. A new apparatus for raising and forcing water or other fluids.

Dated May 25, 1853.

1276. William Babb, of Gray's Inn-road, Middlesex, gentleman. Improvements in the manufacture of hats, caps, and bonnets.

1278. George Irlam Higginson, of Meeting-house-lane, Mary's Abbey, Dublin, sugar-refiner. Improvements in machinery or apparatus for evaporating or concentrating liquids.

1280. James Lovell, of Glasgow, Lanark, Scotland, gentleman. Improvements in heating and ventilating.

1282. Louis Auguste Deverte, of the firm of Deverte and Charles Eck, of Argenteuil, near Paris, France. An improved machinery for combing wool.

1284. Pierre Toussaint Bundervoet, of Ghent, Belgium, merchant. Improvements in shutters. A communication.

1286. Jonathan Dodgson Carr and John Carr, of Carlisle, biscuit-manufacturers. An improved construction of oven.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 3rd, 1853.*)

20. William Edward Newton. Improvements in atmospheric engines. A communication.

30. Emile Grillet. Improvements in renewing the teeth of files.

(*From the "London Gazette," June 7th, 1853.*)

9. Matthew Tomlinson. Certain improvements in the manufacture of species jars or shew jars.

17. Joseph James Welch and John Stewart Margetson. Certain improvements in the manufacture of travelling cases, wrappers, and certain articles of dress hitherto manufactured of leather.

68. Alfred Vincent Newton. An improved mode of separating substances of different specific gravities. A communication.

90. Moses Cartwright. An improvement or improvements in the preparation or manufacture of gypsum or plaster of Paris.

91. Charles Bullivant and Charles Hackney. An improvement or improvements in certain kinds of spoons and ladles.

99. Arthur James. Improvements in means for enclosing needles.

128. Robert Neale. Improvements in the process of copper and other plate and cylinder printing, and inking and wiping and polishing by machinery the engraved plates and cylinders whilst used in the process.

258. Frederick Lawrence, William Davison, and Alfred Lawrence. Improvements in engines to be worked by steam or other fluid.

639. John Scott, junior. Improvements in the treatment or manufacture of animal charcoal.

712. Charles William Siemens. Improvements in rotatory fluid meters.

713. John Beaumont. A new manufacture of certain descriptions of woven fabrics.

726. Robert Hazard. A podombrealentron or an improved apparatus for either sponge or shower-bath and all lavatory purposes.

738. John Scott, junior, and George William Jaffrey. Improvements in steam engines.

983. William Johnson. Improvements in machinery for combing wool, or other fibrous materials. A communication.

1065. Auguste Edouard Loradoux Bellford. Improvements in sawing machines for slitting or resawing plank, or other timber, by means of circular saws. A communication.

1099. James Walker. Improvements in turn-tables used for railways and other purposes.

1107. John Whiteley. Improvements in warp machinery for producing ornamented and textile fabrics.

1121. Christopher Nickels. Improvements in machinery for masticating, kneading, or grinding India-rubber, gutta percha, and other matters.

1170. Abraham Matthews. Improvements in disengaging boats from ships or other vessels.

1182. George Stiff. An improved construction of printing machine.

1190. George Fitz James Russell. An apparatus for disengaging, lowering, and raising ships' boats.

1195. Moses Poole. A new or improved machine for pegging boots or shoes. A communication from Edward L. Norfolk, of the United States of America.

1199. John O'Keefe. Improvements in the manufacture of watch cases.

1204. Robert Walter Swinburne. Improvements in apparatus or machinery to be used in the manufacture of glass.

1206. Eugene Kelt. Certain improvements in pianofortes.

1214. Charles James Pownall. Improvements in the preparation and treatment of flax and other similar vegetable fibres.

1216. Joseph Webb. Improvements in rotatory engines.

1232. William Gossage. Improvements in the manufacture of alkali from common salt.

1238. Thomas Grahame. Improvements in the manufacture of covering materials for houses and other structures and surfaces.

1245. Charles De Bergue. Improvements in the permanent way of railways, and also in chairs, and in sleepers for permanent way.

1246. St. Thomas Baker. Improvements in revolving shutters.

1247. Charles Cowper. Improvements in steam boilers.

1251. Auguste Edouard Loradoux Bellford. Improvements in rotary engines to be driven by steam or any vapour, fluid, or gas, and in boilers or generators to be used in generating steam or gas for driving the aforesaid or other engines, or for other purposes. A communication.

1253. Edward Hammond Bentall. Improved machinery or apparatus for measuring and indicating the power exerted by engines, and also the force required to propel machinery, carriages, or ploughs.

1257. Joseph Betteley. Improvements in anchors.

1259. Louis Gervais Dieudonné Ruffet Delmas Ducayla. An improved manufacture of artificial fuel. A communication.

1262. Auguste Edouard Loradoux Bellford. Improvements in navigable vessels to be employed in all waters, and to be propelled or impelled by sails, steam power, or other means. A communication.

1267. Auguste Edouard Loradoux Bellford. An improved method of treating flax and hemp, whereby they are brought to such a state that they may be carded, spun, and woven by machinery, such as is now employed in the manufacture of cotton and wool into yarn and cloth. A communication.

1268. Amédée Devy. Improvements in storing and preserving grain. A communication.

1272. John Henry Johnson. An improved forge hammer. A communication from Jean Schmerber.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1287. William Haslett Mitchel, of Brooklyn, New York, United States. Improvements in means for distributing and composing types. May 25.

WEEKLY LIST OF PATENTS.

Sealed June 2, 1853.

1852:
934. William Keld Whytehead.
945. Cornelius de Bergue.

Sealed June 3, 1853.

940. Noble Seward.
960. Joseph Bentley.
1008. William Baddeley.
1052. William Irlam.
1065. John Mason.
1145. Wm. Westley and Richard Bayliss.
1154. John Lowther Murphy.

1853:
612. The Hon. Wm. Erskine Cochrane and Wm. Marshall Cochrane.
689. Thomas Sykes.
886. Alfred Vincent Newton.

Sealed June 4, 1853.

1852:
964. Isac Lewis Pulvermacher.

1853:
610. Thomas Butler Dodgson.
859. William Penn Cresson.

Sealed June 6, 1853.

1852:
969. André Jacques Amand Gautier.
972. Charles Alfred Jordery.
976. John Norman.
980. Thomas Conolly and Wm. Cotter.

Sealed June 7, 1853.

1852:
990. Richard Archibald Brooman.
1004. Joseph Hopkins.
1060. William Edward Middleton.
1062. Susan Walker.
1078. James Stevens.
1118. Ferdinand D'Albert.
1127. John Roydes.
1131. John Roberts.
1159. Robert Griffiths.
1172. 7ohn Mason.

1853:
57. William Henderson.
71. Henry Constantine Jennings.
352. Charles Cuylits.
381. Peter Armand Lecomte de Fontainemoreau.
540. William Edward Newton.
629. Thomas Rhodes.
631. James Murdoch.
718. William Keates.
747. Henry Lee Corlett.
793. William Edward Newton.
838. Colin Mather.
887. George Elliott and Wm. Russell.
891. Douglas Hebson.
896. John Hinks and George Wells.
897. Thomas Lovell Preston.
900. Charles Lowe.
908. Charles Green and Jas. Newman.
909. Robert Wyburn.
911. William John Thomas Jones.
912. David Zenner.
913. Alexander Crichton.
917. William Wilkinson.
942. John Chatterton.
944. John Fuller.

Sealed June 8, 1853.

1852:
992. John Browne.
998. Donald Beatson and Thomas Hill.
1002. James Spotswood Wilson.
1009. William Allchin.
1014. Thomas Masters.

1853:
85. William Nairne.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

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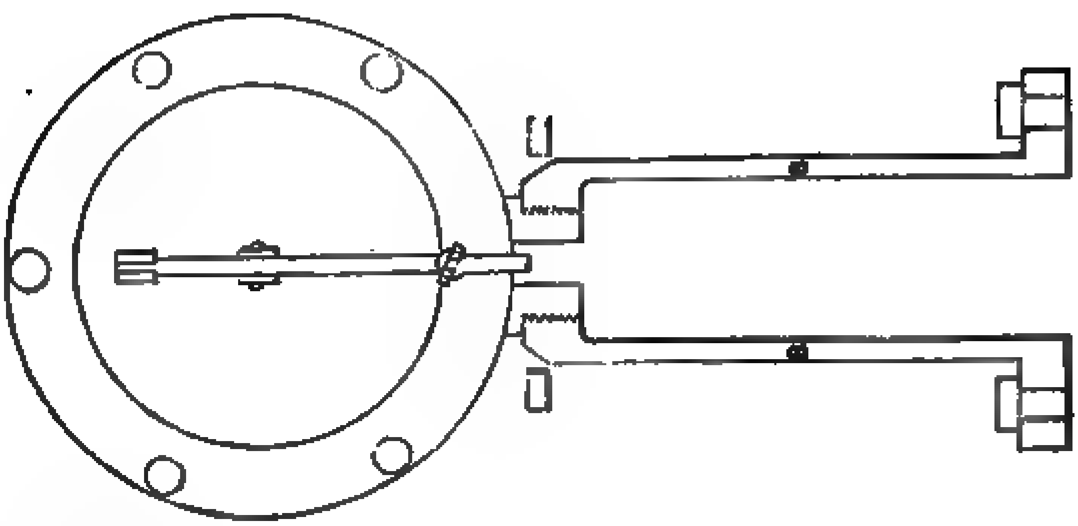
BROOMAN'S PATENT SAFETY-VALVE.

Fig. 1.

Fig. 2.



BROOMAN'S PATENT SAFETY-VALVE.

(Patent dated December 7th, 1852. A communication.)

The principle of this arrangement, for effecting the objects accomplished by the ordinary safety-valve, and the construction proposed by the inventor, will be readily understood on reference to the accompanying figures.

Fig. 1 is a vertical section, and fig. 2 an end elevation of a safety-valve constructed according to the invention. A is the shell of the boiler, to which the apparatus B is riveted or otherwise secured. This apparatus is provided with two steam ways, *b*, *c*, one of which, *b*, is closed by a simple valve, *d*, kept in place by a lever, C, centred in the standard c^1, which allows it to rise, and thus let the steam free when acted on as hereafter explained. The other steamway, *c*, leads into a chamber, D, in the interior of which is fitted the corrugated spring-plate, E, which is capable of yielding under the pressure of steam against it. To the outside of the chamber, D, near the top, is fixed a support, F, from which is suspended the lever, G, the end of the lever being jointed to the support. A rod, *e*, is jointed to the back of the pressure plate, E, and, passing through an aperture in the back plate of the chamber, D, is jointed to the lever, G, at *g*. The lower end of the lever, G, carries an index-pointer, *h*, which travels in front of the scale, I, graduated to any given number of atmospheres or degrees of pressure. At the end of the scale, I, or at any other convenient part, is fastened the small upright, K, which is centred on a stud, *k*. A screw, L, with a milled head, passes through an aperture made in the top of the upright, K, while the bottom of the upright terminates in a catch, *i*, which fits into a corresponding catch, *m*, fitted on the long arm of the lever, C, which commands the valve, *d*, before mentioned, for allowing the escape of the steam.

The action of the apparatus is as follows:—Supposing the parts are to be arranged so that the valve shall allow steam to escape after reaching the pressure of three atmospheres, the screw, L, is turned forward in the upright, K, until its inner end comes exactly over the figure 3 on the scale; and when the pressure shall have exceeded that of three atmospheres, the index-lever, G, being pressed outwards by the pressure plate, E, and rod, *e*, will press against the inner end of the screw, L, the upper end of the upright, K, will be pushed back, while its lower end will make a corresponding motion forward, and will thus disengage the catch, *i*, from the catch, *m*, and liberate the valve-lever, which will fall into the position shown by the dotted lines. The valve, *d*, being then free, will rise and allow the steam to escape. A portion of the steam will pass through the whistle, N, so as to call attention to its liberation. The whole apparatus may be enclosed in a box, and locked, so that the action of the valve may not be tampered with.

The patentee also describes another arrangement, which differs from that described only in the means adopted to give motion to the lever, G, for effecting the liberation of the valve, *d*. In this case the pressure plate, E, instead of being itself the spring, is a solid piston, working as in a cylinder. The pressure plate, E, is connected to the lever, G, by a rod which has a coiled spring around it, and bearing against the back of the plate, in order to bring it back to its position after having been moved by the steam which is admitted to the chamber, D, by a pipe leading from the steam way, *c*. The other parts of the arrangement are the same as have been described above, and the operation of the parts is also the same.

METEOROLOGICAL OBSERVATIONS.

At the Royal Observatory, Greenwich, the mean height of the barometer in the week was 29·880 in. The mean temperature was 51·8 deg., which is 4·8 deg. less than the average of the same week in 38 years. The mean daily temperature was below the average on every day of the week. The wind was in the north.

At the Highfield House Observatory, the following observations were made on Monday and Tuesday last.

	June 6, at 10 P.M.	June 7, at 9 A.M.
Barometer (corrected),	29·868 inches.	29·884 inches.
Thermometer........	54·6 degrees.	68·8 degrees.
Wet bulb thermometer	54·6 „	62·2 „
Direction of wind	N.N.W.	N.W.
Amount of rain	0 050 inches.	0·000 inches.
Amount of cloud	10	6·3

Remarks.—Monday—sultry, with heavy thunder clouds; from 3 till 5 o'clock p.m. thunder, occasionally, in east and south, with rain from 4 p.m. till 7 p.m.; *maximum* heat, 76·0 degrees. Tuesday morning—fine and sultry; the night had been overcast; the temperature fell to 46·3 degrees.

MOORE'S PATENT GREAT CIRCLE INDICATOR.

The science of great circle navigation is one of such immense consequence to the shipping interests of this country, and especially at the present day, when they are in a state of unprecedented prosperity, that we should be disposed to regard with considerable favour any well-directed endeavour to bring its nature and object fully within the comprehension of our mercantile marine, and to facilitate its practice. It is not to be supposed that a principle requiring considerable abstraction can be satisfactorily inculcated without the aid of ingeniously devised models and apparatus; and still less, that its adoption will become universal in long voyages, until the most simple means are furnished for determining the ship's course on the most eligible great circle, or combination of great circles. In the present state of the securities taken by the Government for the competence of our sailors in nautical calculations, and of the course of instruction gone through to satisfy them, we have much reason to doubt whether a substantial knowledge of the geometry of the sphere, sufficient even for the requirements of practice, can be attained. And if we come to the means provided for the working of a ship on the great circle course, we shall find that they are wanting in facility of adaptation to any given circumstances; because, consisting for the most part of tabulated quantities, the results of computations in spherical trigonometry, they cannot be made to apply to the infinitely varied courses which may become necessary. At the same time, a closer approximation to the great circle, depending upon the assumption of smaller differences of longitude or of latitude, and the ready discovery of the corresponding change of the course, is certainly desirable. Without straining the statement of difficulties existing in the practice of great circle sailing as now pursued, we may add, that for the use of seamen, the means presented to them should be of such a nature as to point out at each step the position and course of the vessel, which would give them more confidence in their working than they can derive from merely following a routine of instructions, however accurately and ingeniously these may be framed.

An instrument of much simplicity and beauty, which has attracted much notice this season in the *réunions* of the learned bodies of the metropolis, and which combines in itself the several conditions suggested in the foregoing observations, has been invented and patented by Captain Moore, of the merchant service. From a minute inspection of it, and from employing it in the solution of several problems in spherical trigonometry, analogous to those on which the determination in latitude and longitude of the great circle and composite courses depend, we are able to say that it is admirably adapted for maritime purposes, which it accomplishes with ease and accuracy, at the same time that it has the advantage of susceptibility of adjustment to any proposed voyage. It consists of a combination of graduated circles, forming great circles of the same sphere, some of which admit of revolving upon their axis, and the axis itself of shifting. The circular arcs thus arranged are deposited in a box, which also has a few fixed and graduated circles, and the two sets can be made applicable to the solution of any spherical problem, whether relating to the earth or to the heavens. In all, the principle of operation is the same, viz., that of bringing three of the arcs into the positions necessary to constitute the spherical triangle of solution. The three data are easily employed in the construction of the triangle, and the values of the unknown parts are read off on the proper limbs. In this manner the great circle indicator solves a great variety of problems in plain astronomy, where altitudes, latitudes, longitudes, declinations, azimuths, hour-angles, variations, &c., are concerned. The mode of adjusting the instrument for any problem of this kind will readily occur to any one who is capable of distributing the given quantities among the six parts of the spherical triangle which combines them.

The great use of the indicator, however, as its name imports, is the determination of the path of the great circle. To appreciate the full scope of the problem, let us suppose that a run is to be made from the Cape of Good Hope in latitude 34° south, and longitude 18° 29′ east, to Port Philip. Let us fix upon Cape Otway, the western entrance to Port Philip, and situated in latitude 38° 54′ south and longitude 143° 30′ east, to be the extremity of the great circular arc, upon which, starting from the Cape of Good Hope, the vessel has to travel. Now, if we suppose there is no impediment of winds, seasons, or seas to prevent the ship from pursuing this course throughout, the great question which the seaman is to be informed upon is, what change is he to make in his course for every successive change of longitude which his ship makes upon the circle. The question is one involving more pecularities than would be supposed by those who have not given their attention to it. Proceeding upon the analogy of a straight line being the direction upon which the shortest distance between two points

situated in a plane is to be measured, it might be supposed, upon a first view, that the ship's course ought to remain constant from one point to another upon the surface of a sphere, to make the shortest voyage between the two points. This, however, would be a great mistake. A ship starting from a given point, and sailing in a given direction, would necessarily include the same angle between her course at each point and the meridian passing through it, as she did when she sailed. If a line having that property were traced upon the surface of a sphere, it would be found to approach one of the poles more or less rapidly, and to form an infinite number of circumvolutions about it without ever reaching it. This line, in fact, is called the *loxodromic* line, or oblique course, and has several remarkable properties, one of which is, that though it circulates an infinitude of times about the pole which it approaches, its entire length is not infinite, but can be easily calculated. "Kaufmann's," or Mercator's projection of the sphere, may be described as being that distortion of the spherical surface which exhibits the same bearing, on a plane surface, of the places indicated, as belongs to them on the spherical. One result of this construction is that the loxodromic, or as it is sometimes called, the *rhumb* line, is a straight line. Thus, were it required to ascertain what constant course a ship ought to take from her departure from the Land's End to reach Trinidad, it would only be necessary to join those points on a map constructed upon Mercator's projection, and to sail at the constant angle with each meridian which that line would make. The line so drawn, however, would not be the shortest course, and the loss of ground would depend very much upon the distance between the places, and their differences of latitude and of longitude. Were the shortest distance, that is, the great circle course between the same points, plotted off on Mercator, by latitudes and longitudes from a globe, it would appear longer than the oblique course, because it would be represented by a curve instead of a straight line. It must be remembered, however, that the curve in Mercator is a distortion of a great circle, and that the straight line in Mercator is a distortion of a curve. The curve-line in Mercator is, therefore, the path which the ship must take to perform the shortest distance; but here a difficulty presents itself. On referring to a Mercator's map, upon which a great circle course has been plotted off, it would be found to intersect each successive meridian at a different angle, and therefore the mariner requires to know at what angle he must sail with a given meridian, when he has reached it, in order to keep upon the great circle. Tables have been made out for many voyages, but they cannot apply to all, and it would not only be inconvenient, but accuracy would be sacrificed in an attempt to make a proposed voyage coincide with one, or part of one, though only slightly, which had been tabulated. The problem, therefore, still remains, and in general terms it may be stated as follows. Two points on the surface of a sphere are given in latitude and longitude: required the angle which the great circle passing through them makes with a given meridian included between the meridians of the given points. By spherical trigonometry, the calculation would be as follows. First, the given meridians, and the latitudes and longitudes, furnish three members of a spherical triangle,—viz., two sides and the included angle, the difference of the longitudes, from which we can find the angle of departure from the first meridian. Secondly, the latitude of the starting-point, the angle of departure from it with the meridian, and the ship's longitude, furnish a second triangle, in which two angles are given and the included side; and it is required to find the angle which is opposite to the given side. This is done in spherical trigonometry by a well-known formula, and the result is the ship's course with regard to the meridian, in the given longitude.

This is the problem which the Tables solve, for in certain voyages the difficulty and the labour of making them apply to every possible voyage, and to every change of place will easily be understood. Moore's indicator solves the problem for every voyage, and for the smallest change of place, with the utmost ease. Let us recur to the case which we supposed before,—the passage from the Cape of Good Hope to Cape Otway. How does the captain proceed? He adjusts one limb of the indicator, coinciding in its axis with that of the sphere, to the given difference of longitude transversed in the voyage, and then passes another arc through the two latitudes; which last arc represents the great circle passing through the Cape of Good Hope and Cape Otway. Having clamped the last arc in this position, he moves the first meridional arc into each longitude which the ship makes, and upon a small brass circle, the centre of which moves with the intersection of the two arcs, he leads off in degrees, or points, the angle at which the intersection takes place. This angle is the course which he must sail with regard to the meridian. It is only necessary, therefore, to adjust the instrument at the beginning of the voyage, and for every change of longitude occurring in the passage to observe on the last-mentioned circle the

angle which determines the ship's course. It is obvious that any great circular arc may be similarly treated, and that there is no limitation or difficulty in constructing it.

Hitherto we have supposed that there was no hindrance arising from the season, from icebergs, contrary winds, or other causes, in traversing the great circle between the Cape of Good Hope and Cape Otway throughout its entire length. That great circle, however, leads the mariner into the 59th degree of south latitude, which at most seasons of the year is an impracticable course. He therefore limits himself, say, to the 50th degree of latitude, and resolves to make a run upon one great circle to a particular point situated in that parallel, and then to run upon another great circle from that point to Cape Otway. The more southerly he fixes his parallel, the more will he approximate to the large saving which the great circle would give him; but he sacrifices a portion of this advantage to considerations of expediency or necessity, and the limiting parallel of his voyage having been fixed upon, the question is to know the longitude of the point in that latitude which he is to run to, so that the sum of the two arcs of great circles shall be a minimum of all the couples of arcs that could be drawn. Under the assumed circumstances, this is the most advantageous course for him to take, though the practice at present is different. In the supposed case, the ship, according to the present system of great circle sailing, would proceed upon the great circle between the Cape and Cape Otway until she reached the 50th parallel, having attained which, she would go upon the parallel until she got upon the great circle again, and finish her voyage upon the great circle. Her best course, however, is that which we have suggested above, and which for the 50th parallel, would consist of two arcs of great circles converging near 86° east longitude. To compare the relative merits of these several courses, we have the great circle course from the Cape of Good Hope to Cape Otway, measuring 5,448 nautical miles, the composite course of two great circular arcs meeting in latitude 50° and longitude 86°, 5,520 nautical miles, and the composite small circle and large circle course, 5,689 nautical miles. Mercator's distance is 6,025 nautical miles.

The indicator is applicable to the determination of the elements of all these courses, and the simplicity and ingenuity of its details does honour to the inventive ingenuity of Mr. Moore, at the same time that the instrument itself displays a minute acquaintance with his subject in theory and in practice. In the formation of the marine colleges which we understand are to be established, the advantages that would result to the service from the practical instructions of a gentleman so well qualified for the task would be very great; and either in that shape, or in some other, we hope he may speedily reap a fair reward for the long-continued exertions which have resulted in the practical development of the system of great circle sailing.

SOCIETY OF ARTS.

DISTRIBUTION OF MEDALS AND PREMIUMS.

On Friday last the ninety-ninth session of the Society of Arts was formally closed by the usual ceremony of distributing the premiums awarded by the Council for meritorious inventions and essays. His Royal Highness Prince Albert, as President of the Society, filled the chair on the occasion, which, as in former years, drew to the great room of the Society's house, in the Adelphi, a densely-thronged assemblage of members and visitors of the higher classes. Owing to the great number of gentlemen representing local institutions in union with the Society, and the mayors of provincial towns, who were then in the metropolis, an unusual degree of exertion was made on the part of the visitors generally to be present during the proceedings. Although the chair was announced to be taken at half-past four o'clock, many arrived as early as half-past one, and great numbers were necessarily disappointed. The power of accommodation which the room afforded was turned to the best account by the excellent arrangements of Mr. Solly, the Secretary, Mr. Forrest, the Assistant-Secretary, and Mr. Davenport, and the proceedings of the day, always interesting to the friends of science and art, went off to the complete satisfaction of all who witnessed them.

His Royal Highness entered the room at the hour announced, attended by the Marquis of Lansdowne, Lord Granville, Lord Colborne, Mr. Hume, M. P., Mr. T. Hope, M. P., &c., &c. His Royal Highness looked remarkably well, and was received with the warmest demonstrations of welcome.

Silence having been proclaimed,

His Royal Highness briefly opened the proceedings, and called upon Mr. Solly, the Secretary, to read his Report, explanatory of the causes which had induced the Society to depart from its former practice with regard to premiums.

The Secretary read, accordingly, the following Report:—"Since the last general meeting of the Society, for the distribution of premiums, three years have elapsed, and

this period has certainly not been the least eventful portion of the history of the Society, whether the subjects which have occupied the whole body, or the exertions of individual members, be considered. If there were no other circumstances to chronicle than those which relate to the part taken by the Society in connection with the Great Exhibition, there would be much connected with the industrial progress of the world to record, as affording a proof that the history of that great event has a new and ever glorious importance, when taken in connection with the rapidly-developing spirit of international co-operation, of which it was, in truth, the first illustration. The share which this Society had in the progress of the Great Exhibition, will be recorded in the history of our country. In 1851, the ordinary prize-list of the Society was altogether suspended; and in place of it special premiums connected with the Exhibition were offered. It must not be supposed, however, that, in consequence of the time and attention thus devoted to these particular subjects, the other branches of the Society's operations have been abandoned or neglected. On the contrary, it is probable that in no three years of the last century has the Society done more to advance the true interests of the arts, manufactures, and commerce of the country, than it has in the last three sessions. This is not the time to enumerate the good works which the Society has undertaken, or carried out; yet it is right that I should remind you of this, and that I should observe that, if a smaller number of prizes are now given than used to be the case, it is not because the Society is less able, or less willing than it formerly was, to reward merit; but because, from the altered spirit of the times, the encouragement and aid of the Society is less needed as a means of bringing forth isolated inventions, and latent talents, but is more urgently required in the development of enlarged generalisations and comprehensive measures."

The distribution of prizes was then proceeded with, each of the individuals mentioned in the subjoined list being courteously presented by his Royal Highness with the honour awarded to him by the Council. The names are here classified according to the award:

THE ISIS GOLD MEDAL.

Mr. William Clerichew, of Ceylon, for his Improvements in the Curing of Coffee.

THE ISIS MEDAL.

Mr. James Taylor, of Elgin, for his Essay on the Cotton Manufactures of India.

Admiral Sir Henry Hart, of Greenwich, for his mode of Curing Smoky Chimneys.

Mr. J. Rock, jun., of Hastings, for his new Carriage-spring.

THE SILVER MEDAL.

Mr. Joshua Rogers, of 133, Bunhill-row, for his Shilling Box of Water Colours.

Mr. John Cronmire, 10, Cottage-lane, Commercial-road East, for his Half-crown Box of Mathematical Instruments.

Mr. Henry Weekes, A.R.A., for his Essay on the Fine Arts Department of the Great Exhibition.

Mr. F. C. Bakewell, for his Essay on the Machinery of the Great Exhibition.

Mr. R. G. Salter, for his Method of Flushing Sewers.

Mr. V. Vaughan, of Maidstone, for his Machine for putting up Chimney-pieces.

THE SOCIETY'S MEDAL.

Mr. W. Bollaert, for his Essay on the use and preparation of Salt.

Mr. H. Owen Husskison, for his Essay on the use and preparation of Salt.

Mr. John Dalton, of Hollingworth, for his Double Register Calico Printing.

Mr. G. Scholes, of Landport, for his Slide Motion Indicator.

Mr. G. Edwards, for his Improved Portable Photographic Camera.

Mr. J. Toynbee, F.R.S., for his Artificial Tympanic Membrane.

Mr. W. Wood, for his improved method of Teaching Music to the Blind.

Mr. A. Claudet, for his Essay on the Stereoscope, and its application to Photography.

Mr. Joseph Hopkins, of Worcester, for his mode of giving Equatorial Motion to Telescopes.

Mr. G. Jennings, for his improvements connected with the Drainage of Houses.

Mr. H. J. Saxby, of Miletown, Sheerness, for his new Lock. (And £10.)

Mrs. A. Thomson, of New Bond-street, for Four Drawings in Outline.

Mr. W. Stones, of Queenhithe, for his Essay on the Manufacture of Paper.

Mr. C. Shepherd, jun., of Leadenhall-street, for his improvements in Electric Clocks.

The Rev. W. T. Kingsley, of Cambridge, for his discoveries in Photography.

The Very Rev. the Dean of Hereford, for his Essay on Self-supporting Schools.

Mr. James Hole, of Leeds, for his Essay on the History and Management of Literary, Scientific, and Mechanics' Institutions. (And £50.)

THE THANKS OF THE SOCIETY.

Dr. Robinson, of Newcastle, for his Improved Safety Lamp for Miners.

Mr. Jonas Bateman, for his Improved Life-boat.

Dr. Stolle, of Berlin, for his Essay on the Manufacture of Sugar.

Dr. Cumin, of Bath, for his Specimens of Paper from Sugar-cane Refuse.

Dr. Lloyd, of Warwick, for his Samples of Paper made from the Refuse of Cow-houses.

Professor Jack, of New Brunswick, for his Essay on the Decimal System of Weights and Measures.

With respect to the most important of these subjects, we have to offer the following remarks.

Mr. William Clerichew's improvements in the curing of coffee are in principle similar to the desiccating process of Messrs. Davison and Symington. His method of proceeding is extensively adopted in Ceylon, and apparently with considerable success. The coffee imported into this country from the plantations where his process is employed, fetches a higher price in the market, and brokers seek for it with great eagerness.

Mr. James Taylor's Essay on the Cotton Manufactures of India was written in consequence of the premium offered by the Society for an attempt to develop the capabilities of India, to supply the deficiencies which have been complained of in the American cotton crops by our merchants. In this respect his essay is elaborate and valuable.

Mr. Rock's new carriage-spring has already been described in the *Mechanics' Magazine*, with engravings. The principle of the invention consists in giving longitudinal corrugations to the plates, with their convexities upwards. The result is a greater degree of resistance with a smaller weight of metal; a single plate on this plan being equal in effect to that of several of the ordinary kinds.

Mr. Joshua Rogers' shilling box of water-colours, and Mr. John Cronmire's half-crown box of mathematical instruments were invented in pursuance of an invitation by the Society to attempt the bringing of the principal appliances of practical art within the compass of the small means of humble aspirants. It was thought, and no doubt justly, that if these men could procure the means of executing designs to a scale, and of finishing them off in light and shade with tolerable accuracy and elegance, many valuable drawings of great practical use would be acquired, which at present could not see the light. The boxes have been well conceived and made up with reference to the objects in view.

Mr. Weeke's essay on the fine arts Department of the Great Exhibition; and Mr. F. C. Bakewell's on its machinery, are the result of a change which the Society introduced into its prize list after the Great Exhibition. It was thought not desirable to issue the same detailed list of premiums, but to offer prizes for specific essays on the great departments of the Exhibition. These essays were written on two of those departments.

The essays on the use and preparation of salt, written by Mr. W. Bollaert and by Mr. H. O. Huskisson, were also called forth by the offer of a premium. The object in view by the Society was, to obtain a substantial account of the recent improvements introduced into the manufacture of salt; more especially in the evaporation of the brine, and the application of salt to new manufactures. It was also intended to draw attention to the extensive masses of rock-salt discovered in Ireland within the last twelve months, the quality of which was said to be so pure that the salt looked as transparent as a piece of glass. Both papers treated largely of this subject.

Mr. John Dalton's process of double-register calico-printing, prints the fabric on both sides with great accuracy. An extensive firm in Manchester is about to adopt it, with the certainty of effecting an economy of £1,000 per annum. It is said to be accurate, economical in working, and easy of application.

Mr. Schole's slide-motion indicator is an instrument designed for the purpose of determining the magnitude of the various portions of slide-valves, on any scale.

Mr. G. Edwards' portable photographic camera combines, in a great degree, several good qualities for an instrument of this description, and is especially useful for tourists. It admits of a large field for the actinic process to go forward in, and is extremely portable, and inexpensive in its manufacture.

Mr. J. Toynbee's artificial tympanic membrane is a simple and ingenious arrangement, whereby a slight membranous diaphragm is adapted to the ears of deaf persons. It is highly spoken of by the faculty.

M. W. Wood's mode of teaching music to the blind, is an adaptation to musical purposes of the system of embossed printing, which has proved very successful with the blind in teaching them to read. So far as it has been tried with reference to music, its results are encouraging.

M. Claudet's paper on the stereoscope, and its applications in photography, was reported in No. 1537 of the *Mechanics' Magazine*.

Mr. Hopkins' telescope is rendered cir-

cumpolar, or receives an equatorial motion about an axis parallel to that of the earth's axis, by means of an extremely simple adjustment. This adjustment is effected by means of a perforated plate adapted to the axis, by looking through which the place of the true pole is ascertained with reference to the pole-star, and ϵ and ζ Ursæ Majoris. Another purpose of the instrument is that of an astrostat, by which a given star can be kept in the field of the instrument. The necessary movements are produced by means of weights and a simple hydraulic apparatus. On a future occasion we purpose describing this invention in detail.

Mr. Saxby is a blacksmith, living near Sheerness. The medal which he received, and the award with which it was accompanied, afford a remarkable illustration of the excellent results which the extensive operations of the Society are achieving in the promotion of art. He is a member of a local institution in union with the Society, and he there saw the list of the Society's premiums. In his capacity of blacksmith in a country district, a great number of locks pass through his hands for repairs; and seeing that a reward was offered for a cheap and effective lock, he resolved to bring forward an invention which was the result of the attention he had bestowed upon the subject; and which he found himself precluded from patenting. It appears that he took the case of an old warded lock, from which he merely removed the wards, and then fixed in it a circular plate capable of revolving about a fixed centre. Four radial slots were cut in this plate, though the principle admitted of a greater number for large locks, and in each of these slots a bolt traversed, acted upon from the centre by means of a spring. The key of the lock has no bit, the stump being filed down in such a manner, that on entering the key-hole, it acts to thrust the bolts radially outward, leaving the rotatory disc free, and on turning a stud the bolts are thrown. In point of principle the arrangement is something similar to Bramah's lock; the thrust, instead of taking place longitudinally, is directed from a centre.

Mrs. Thompson's drawings in outline were sent in, in pursuance of the offer of a premium for the best series of four outline drawings in illustration of the approach of Night, as described in Petrarch's third ode, commencing with the words, "*Nella stagion che'l ciel rapido inclina.*" Remarking upon the importance of outline drawing with culture of the fine arts, the *Journal of the Society of Arts*, offered the following observations, which are borne out by drawings:

"Outline is an arbitrary mode of conveying ideas of form, which has its foundation altogether in art, and was its first essay towards perfection; and although the progress of painting has been so great as to nearly approach complete imitation by the help of light, and shadow, and colour; yet outline, simple and unaided, still remains duly appreciated, as efficient to produce the greatest and most essential purposes of art, viz., the ideas of action and impression in the figures it represents. There is not, in fact, any such thing as an outline in Nature; yet we recollect more of a form by its boundary, or separation from other parts, than by its parts projecting towards us; hence arises the satisfaction we receive from a line that truly marks that boundary; though no such line in reality exists. The imagination immediately loses sight of the fallacy, and dwells upon the form within it. A true outline is a perfect thing; it has no exemplar in Nature, but is received as an arbitrary token of a substance. The image it excites is, indeed, more or less perfect according to the information or force of imagination in the beholder. Fill it with colour and light and shade, and thus attempt to make it an imitation of a real object, and it becomes subject to comparisons which, in well-informed minds, may diminish its force. Its simplicity is the basis of its power.

"The value of outline may be fully appreciated by those who have observed the great degree of character displayed in profile outlines, and still more by those who are familiar with the beautiful works in outline by Flaxman, Retsch, and others. In regarding many of these, the mind is so entirely filled with the action and expression of the figures, and the ideas they suggest, that it shrinks from the notion of an attempt at further completion. Outline appears to be an art that, pure and abstracted from the bustling commonplaces of the world, is especially fitted to convey and illustrate poetic thoughts and images. In all departments of it art is also most *practically* useful."

The object of the Society in offering the premium has been well borne out by the works of this lady, which are remarkable alike for their conception and execution.

Mr. Stones' Essay on the Manufacture of Paper exhibits its present state with much minuteness of detail.

The Rev. M. Kingsley's discoveries in photography consist chiefly in the employment of bromine, instead of mercury, in the development of the incipient image; an important improvement in the art, when the deleterious effects of the fumes of mercury are considered.

Mr. Hole's Essay is in the hands of the Messrs. Longman, for publication.

Dr. Stolle's Essay on the Manufacture of Sugar procured for its author the gold

medal offered by His Royal Highness Prince Albert.

Dr. Cumin's specimens of paper from sugar-cane refuse have been much approved.

Dr. Lloyd's process of making paper from the refuse of cow-houses assumes a high degree of importance at the present time, when the probability of a removal of the paper-duty is becoming every day greater. It appears that he feeds his cows with the straw of the flax-plant, after it has been used in manufacture. The cows digest the oil and gummy matter which remains in it, and which is found to be extremely fattening. The flax refuse, so macerated, is collected, and from it the paper is made. This is a new and remarkable instance in which this invaluable animal administers to the wants of man. Her milk has already been used with economy and advantage, as a substitute for olive-oil, in fixing the colours of manufactured articles, and cheese is now employed to produce the brilliant blue colours of *barèges*, which could not otherwise be fixed. What will appear stranger still, though not less true, is, that the essences of fruits now sold in such large quantities, are also extracted from the refuse of the cow-yard.

The Marquis of Lansdowne, seconded by Lord Colborne, moved a vote of thanks to His Royal Highness, which was passed by acclamation; and after a few words of reply from His Royal Highness, expressive of the pleasure with which he had attended, in the performance of what he deemed his duty as President of the Society, His Royal Highness left the house, and the proceedings terminated.

THE TRADES OF BIRMINGHAM.

THE brass-foundry and braziery businesses continue extremely, and the manufacture of tin wares, more than usually busy. There has been no change announced in the price of copper during the present week, and all seems to be uncertainty whether the next move will be a rise or a fall. There is, we understand, an abundance of copper in the market, and there are parties who are anxious to buy, but await another reduction, which, in their opinion, is impending. On the other hand, the state of our relations with Russia, whence we obtain a considerable quantity of our supplies, would seem to indicate a probable advance rather than fall of price.

The heavy machinery-works in the neighbourhood are fully employed, and a great amount of foreign work is on hand. It is pleasing also to observe that, notwithstanding the abundance of employment in those establishments where first-rate mechanics are required, and in some instances the scarcity of men and labour, the best understanding appears to exist between the master machinists and the operatives of the neighbourhood.

At the works of the Digbeth Battery Company some large orders for copper work, electric telegraph wire, &c., are being executed. A contract has recently been entered into by the firm for the manufacture of about thirty tons of copper metal, or "battery," as it is termed in trade, intended for South America. In making this description of work it is found that Russian copper is more suitable, and consequently it is in demand. In the article of wire, for telegraphic purposes, there is a large business being done, and immense lengths are prepared weekly. Scarcely a day passes that several tons are not forwarded by rail to Liverpool and London; the latter for the construction of the various communications contemplated throughout the Continent. By means of a new welding process alluded to in a former letter, the manufacturers are now enabled to produce the wire with extraordinary rapidity, and contracts are speedily executed.

In respect to every department of trade peculiar to Birmingham and the neighbourhood, the Government statement is corroborative of the reports given from time to time in these columns for the last twelve or eighteen months. The return, as a matter of course, is for the whole kingdom; but it is needless to say that to the increase in the exports of the following articles Birmingham and its vicinity largely contributed, and in their profits proportionately participated:

	1852.	1353.	Inrease.
Hardware and cutlery	£209,629	£316,219	£166,873
Machinery	70,590	143,741	73,151
Iron	515,812	1,112,972	597,160
Steel	40,516	65,088	24,567
Copper	93,577	172,053	78,476
Brass	6,492	8,649	2,157
Tin plates	99,959	101,157	1,198
		Increase	£943,582

Nothing can more clearly exhibit the increasing prosperity of the British metal and hardware trades, notwithstanding the competition of the German and Belgium makers, to which our Birmingham manufacturers have been more particularly subjected. It has been properly remarked that the quantities exported have not kept pace with the values, and consequently that price is an important element in any consideration of these figures. For instance, the average price of the bolt, bar, and rod iron exported in May, 1851, as represented by the "declared value," was £5 12s. 6d. per ton, while this year the average price has

increased to upwards of £8 per ton. Still, with this qualification, the actual extension of the trade is prodigious.

THE IRON TRADE.

The *Birmingham Mercury*, of Saturday morning, in reference to the present condition of the iron trade, says:—"A great deal of uneasiness is manifested by the iron-masters as to what will be done with Mr. John Atwood's iron, whether steps will be taken by the inspectors to throw it at once into the market, or keep it in abeyance until some future period. Some would rather it were thrown into the market at once, in order that they may know the worst, than that it should be kept back, operating as it does, prejudicially upon the trade. We have all along stated that the present excessive make of pigs, which is between 2,000,000 and 3,000,000 annually, cannot be worked off, and, as a natural consequence, gluts the market. The first-rate houses are stacking their pigs rather than sell them at a loss, while others, who are in want of cash, are selling them for what they can get. This state of things cannot last long in the present high state of the labour market. Parties cannot work and live by the loss, and it is a well known fact that when we take into consideration the present price of coal and stone, which are nearly double what they were nine months ago, pigs cannot be sold now at £4, which were realizing then £2 12s. 6d. and £2 15s., and parties get a profit. It is a great pity that the pig-makers cannot see that their excessive make does them a serious injury, and puts into the pockets of the owners of mills and forges the profits they should have; for it is well known that the price of manufactured iron is great as compared with the price of pigs. Sheets and plates are being sold by the first houses at £11 10s., and bars at £10 per ton. It is true that some parties are selling at a less rate, but they are buying their pigs at £4 per ton, and are therefore realizing a great profit. Some parties are talking of interfering with the present high rate of wages, but they will find this a difficult matter while labour generally is in great request. Iron-masters should have considered this when they were raising the price of iron so fast—a step which has proved injurious rather than otherwise to the community." There can be no question, however, notwithstanding the heavy orders which, from all accounts, are expected from North America, that the present high prices of manufactured iron are far from being so firm as they were a fortnight or three weeks ago. We heard during the early part of the week that some descriptions of iron were 10s. lower.

Glasgow Pig-Iron Market.—Glasgow, June 11.—The threatening aspect of affairs between Turkey and Russia has this week operated injuriously on pig iron, and a decline of 2s. per ton has been submitted to. To-day the nominal price of warrants is 51s., buyers offering 50s. 6d., while one parcel or so was placed at 50s. 9d.; No. 1 g. m. b., 52s. 6d.; Gartsherrie, 55s. 6d.

WINCHESTER'S PATENT SPLINT.

(Patent dated November 24, 1852.)

THE construction of the splint described in this specification is intended to remove a defect which has hitherto been found in practice to diminish the beneficial effect of this surgical appliance. In the best form of the splint at present in use, there is a want of that flexibility in each direction which is necessary, in order that the instrument should adapt itself with readiness to the figure of any portion of the human body. Mr. Winchester has aimed at producing a splint which should be so far free from this objection, as to assume immediately the figure of the limb, or portion of the body, with which it is placed in contact, retaining the figure so impressed upon it, even in the most minute peculiarities of configuration.

The great disadvantage incidental to the use of a straight splint, to say nothing of the unnecessary uneasiness in the patient, of which it is the cause, is, that its figure not coinciding with that of the limb, which is always made up of curved lines, the tendency of the operation is to strengthen the limb. This distorting action interferes more or less with the process of union, and the necessity for a better arrangement is on other accounts desirable. Mr. Winchester's splint gets rid of all this mischief. By being first applied to the counterpart limb on the other side of the body, its exact form is at once impressed upon it, and in this state its application to the part under treatment is in every way satisfactory, admirably seconding the efforts of nature, and giving increased tranquillity to the patient, which is always desirable.

By a combination of pieces of wood, or metal, at once simple, ingenious, and effective, he has succeeded in accomplishing this object, which is certain to be welcomed by the surgical profession as a great improvement on the means they have to employ. Examples of this splint were exhibited at the recent *soirée* of the President of the Institute of Civil Engineers, where it attracted

much notice, and was highly approved by the medical gentlemen present.

The elementary pieces of wood, metal, or whatever other material may be selected, are connected longitudinally by means of joints, which can be fixed in any desired position. In some cases, also the patentee uses joints which give a free lateral motion to the splint. With a splint constructed on this principle, the mode of operation will be as follows:—Supposing a thigh-bone to be fractured, the operator applies the splint to the other thigh, of which it takes the exact shape and form, by the exertion of a slight pressure. He then tightens up, and fastens the joints between each separate piece composing the splint. Having thus obtained the exact shape of the limb, he next applies the splint to the fractured limb. In the event of both thighs being fractured, or of the patient having only one, the operator must set the splint to the shape of the limb, after having placed the bones in perfect apposition. The patentee's splint may serve for a mould from which to cast another splint, but he recommends the use of that splint by which the form of the limb is taken.

The manner in which the invention may be performed is shown in the annexed engravings.

Fig. 1 is a plan, and fig. 2 a side view of

Fig. 1. Fig. 3.

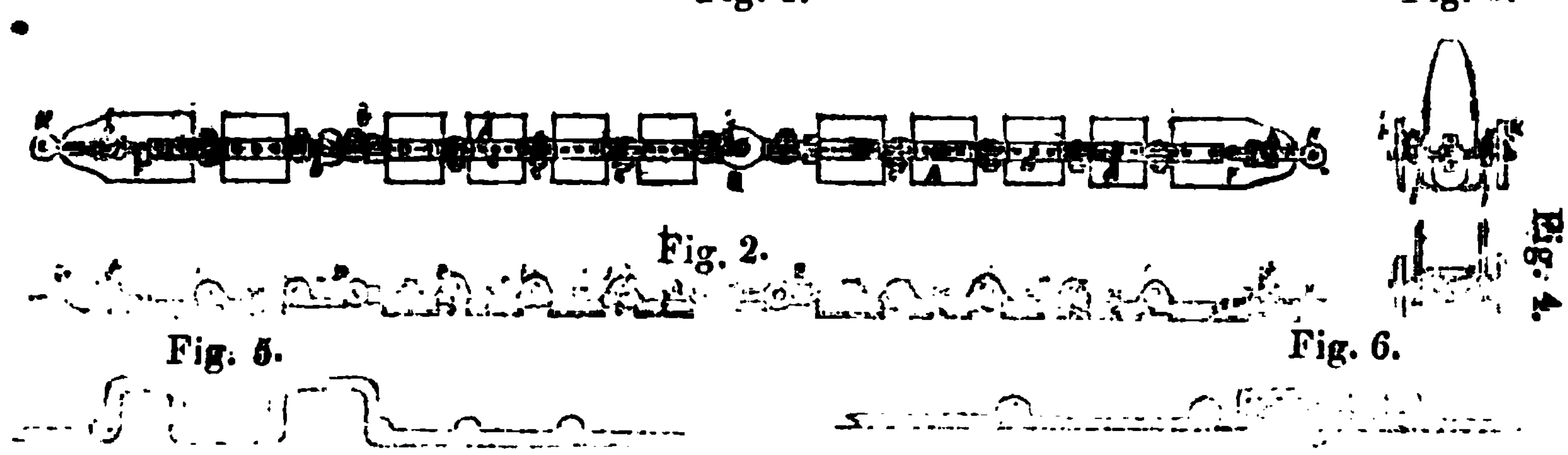


Fig. 2.

Fig. 5. Fig. 6.

a splint constructed according to the invention. A A are a series of pieces of metal, wood, gutta percha, or other suitable material, which form the pads of the splint. These pieces are hollowed on that side which is to be placed next to the injured limb, so as better to adapt it to the part being treated. B B are strips of metal secured to the pads, A A, by countersunk screws, *a a*, and connected together by means of the hinge-joint, C C. The pins of each of the joints are made with square parts, which fit into square holes in the portions, *b b*, of the ends of the strips, B, while the ends of the pins are cut with a screw-thread to correspond with the nuts, *c c*. The joint can be tightened up by a key fitting the shoulders of the pins, so as to render the splint perfectly rigid, after it has been set to the required form. D and E are joints which may be employed when requisite, to allow of motion to the knee or elbow-joints, the hip, or any other portion of the body requiring a lateral motion. They can be rendered perfectly rigid by the pinching-screws, *d* and *e*. F is the ankle-piece. G G are studs or pins which project from the pieces, B, and are for the purpose of attaching the straps for fastening the splint to the broken limb, or part requiring support.

Figs. 3 and 4 are views of the foot-piece, which is attached to the splint by the plate, H. This plate has punched in it a series of circular recesses, so that when the plate is passed through the square socket, *h*, on the ankle-piece, F, it can be permanently fixed by the pinching-screw, *i*. By this arrangement the foot-piece can be readily adjusted. I I are stays for keeping the foot-piece in its proper position, and for preventing the leg from swaying or falling over. K K are small wheels or rollers which turn upon an axle passed through the tube, L, attached to the bottom of the foot-piece. These rollers are for the purpose of allowing the patient to draw up the leg more easily, and to prevent any strain upon the injured part. In case of any wound occurring in the line of the splint, or on that part of the body to which the splint is applied, the patentee inserts in the length of the splint bent pieces of metal, such as are represented in fig. 5; which pass without contact over the wound. This expedient gives the surgeon free access for the purpose of dressing the wound, and at the same time all irritation at that part is prevented. Fig. 6 represents a modification of the hip-joint, E, and analogous to the ball-and-socket joint. This joint admits of all the necessary motion of the hip, without deranging the other parts of the splint.

GARDINER'S COMPOUND RAILWAY-CARRIAGE AXLE.

A coupled railway-carriage axle, which has been invented by Mr. P. Gardiner, of New York, and undergone repeated trials with the most satisfactory results, is described in the *Scientific American*, of the 7th ult., from which we condense the following account of it:

"Every wheel is shrunk upon a sleeve, which has a loose inside flange upon it, and a small rim on the inside of the flange. The axle has a fixed flange upon it, inside of the wheel, and it extends through the sleeves. The sleeves of the wheel, therefore, run upon the axle, and are like long boxes, which are secured by the screw-bolts, as represented in the figures. By the peculiar arrangement of the axle, an independent motion is given to the opposite wheels without affecting their relative lateral action. The excessive strain upon the common axle in turning narrow curves is obviated, and the danger of breakage removed. In turning curves of average radius, and with ordinary trains, a large portion of the motive power may be saved. With the common axle, owing to the greater distance to be traversed in the same time by the wheel on the outer rail, all the wheels on one rail must slide, to compensate for the natural tendency to a difference in velocity. With this axle, each wheel moves with a velocity due to the length of rail to be traversed. In the application of the brakes, the torsion of the axle is also obviated, each wheel turning with the velocity due to the pressure of the brake on itself, and not affecting, or being affected by, the other.

This axle for railway-carriages should certainly attract the attention of our railway companies; it has been tested on some of our railways, and, as we have been informed, it has succeeded admirably. A number of our railroads are now adopting them, after repeated and fair trials to test their efficacy and superiority over the common axle. Every improvement which has for its object the prevention of railroad accidents, by obviating the breaking of axles, merits our approbation; and every improvement which prevents accidents, we are confident lessens the expenses of railroad companies, and increases the travel upon them.

LOSEBY'S CHRONOMETERS.

Mr. Loseby has replied in the following terms to Mr. Denison's observations on the working of his chronometers, and as was understood at the period of the discussion of his papers, a notice of which appeared in the *Mechanics' Magazine*, he forwarded his reply to the *Journal of the Society of Arts*. Having formed a high opinion of Mr. Loseby's mercurial compensation, we feel great pleasure in giving publicity to his remarks.

Mr. Denison observes, that if we take the average weekly rate of each chronometer for the first eight weeks, as shown in the page exhibiting the order of temperature, we shall have a very good indication of its going in the extreme cold; and in like manner the average rate for the eight middle weeks will show the effect of the compensation for mean temperature; whilst the average of the last eight weeks will show the effect of the compensation for extreme heat; — eliminated as far as possible by taking the average of a tolerably long period of temperature of one kind.

Now if this rule simply increased the length of trial in each temperature, it would be a very good one for arriving at the effect of the secondary compensation. On examination, however, it will be found to do a great deal more.

Let us try it by example on the chronometer rates of last year; for which purpose I extract the following temperatures in each of the twenty-five weeks, during the trial of chronometers at the Royal Observatory in 1852, from the Government list, at pages 4 and 5, and arrange them in the divisions proposed by Mr. Denison.

Temperatures in the first 8 weeks.	Temperatures in the second 8 weeks.	Temperatures in the third division of 9 weeks.
21°	46°	54°
49	56	64
30	42	57
46	52	66
28	47	60
49	56	69
30	45	61
48	60	68
32	49	80
52	61	106
34	52	80
52	61	115
35	56	82
56	63	109
47	56	76
60	63	106
——	——	84
16)669(42	16)865(54	106
64	80	——
——	——	18)1443(80
29	65	1440
32	64	——

On looking over this example, we find the following:

1. That the column which should represent the extreme cold varies in temperature from 21° to 60°; that the second column varies from 42° to 63°; whilst the third column varies from 54° to 115°. None of the three periods, therefore, consist exclusively either of extreme cold, middle temperature, or of extreme heat; but each period contains a variety of temperatures intermingled together. Now the chronometer might gain in one temperature and lose in another; but if the two were mixed together, it would make it appear that it had neither gained nor lost, and it would consequently not be possible to ascertain the error from the individual temperatures unless they were kept distinct from each other.

2. That if each column of temperatures be added together, and divided for the mean, we find the extremes are not 21° and 115°, as set down in Mr. Denison's Table, printed in No. 27 of the Journal, but 42° and 80°; in fact, little more than middle temperatures compared with the others.

3. That we have only three temperatures to judge of, when in reality the secondary compensation is not merely required for three points on the thermometer, but for every temperature throughout the range; and to show the fallacy of the rule in this particular, I need only observe that had it been carried a step further, and the three temperatures reduced to one, it would have proved that no compensation was necessary for change of temperature at all.

4. That even the three divisions into which the rule reduces the temperatures, are not extreme cold, middle temperature, and extreme heat, but 42°, 54°, and 80°,—temperatures at which the effect of the secondary compensation would scarcely be appreciable; for I need not remind practical men that when the ordinary balance, unassisted by supplemental compensation, is adjusted at 42° and 80°, the error at 54°, from its being only 12° above the lower temperature, will be very small.

However favourable, therefore, this method of analyzing the rates may be to the kind of supplemental compensation which can only be adjusted for certain temperatures at the expense of producing sudden irregularity in others, it is unfitted for arriving at the chronometer's performance in every gradation of temperature; and therefore useless for determining the relative merits of the different modes of secondary compensation.

Yet it is upon this foundation that Mr. Denison has ventured to pronounce the Observatory rule all wrong for this purpose, and that my chronometers, instead of being first four years out of five, have been beaten every year. Now, had the Observatory rule not been correct, it is the rule by which the competitors knew the merits of their chronometers would be determined; and therefore it would be unfair for any one to come forward after the trials were over, and say, "It is true your chronometers have beaten the others according to the original conditions, but here is a rule that will reverse the order of things; and to adopt this course on such a rule as that employed by Mr. Denison, will probably appear strange to the members of the Society of Arts."

Having noticed Mr. Denison's rule, I will now describe the method by which the merits of the chronometers have been determined at the Observatory for many years past. This method consists in ascertaining from the weekly sums of daily rates in the order of time—not in the order of temperature, as Mr. Denison has it—first, the difference between the greatest and least weekly rate during the whole trial; and, secondly, the greatest difference between one week's rate and the next. These errors are given in two columns on the last page of the rates; and the chronometers are arranged in the order of merit by multiplying the number of seconds in the column headed, "Greatest difference between one week and the next" by 2, and adding the product to the seconds contained in the other column, which gives the trial number. It was by this rule that the Table given in the abstract of my paper (*vide* No. 27 of the Journal) and the one now added were arranged.

Errors of Dent's Chronometers in the Observatory Trials from 1848 to 1852.

Year.	No. of Chronometer.	Position in order of merit.	Difference between the greatest and least.	Greatest difference between one week and the next.	Trial No.
			s.	s.	
1848	2035	8th	21·4	6·1	33·6
	2100	22nd	29·7	8·0	45·7
1849	2100	13th	33·2	20·1	73·4
1850	2173	3rd	13·2	9·2	31·7
1851	2255	9th	26·7	17·9	62·5
1852	2240	3rd	15·9	12·0	39·9
			6)140·1	6)73·3	6)286·8
Average of the whole......			23·3	12·2	47·8

Errors of Loseby's Chronometers in the same Trials.

Year.	No. of Chronometer.	Position in order of merit.	Difference between the greatest and least.	Greatest difference between one week and the next.	Trial No.
			s.	s.	
1848	115	1st	8·7	4·6	17·9
	118	3rd	13·3	6·6	26·5
1849	124	3rd	17·3	9·2	35·7
1850	123	1st	12·7	4·7	22·1
1851	127	1st	16·5	4·4	25·3
1852	125	1st	11·7	9·4	30·5
			6)80·2	6)38·9	6)158·0
Average of the whole......			13·3	6·5	26·3

From this Table it will be seen that in the average of five years, the errors of Mr. Dent's chronometers is nearly double the error of mine; that in the most favourable instance it is one-third more; whilst in one trial, that of 1851, the error is nearly three times greater.

Now, had one construction of vessel beaten another five years in succession in the average proportion of one-half the entire distance sailed over, there would not have remained much doubt of the great superiority of one construction over the other.

Mr. Denison affirms that this excellence has simply been owing to the care I have personally bestowed on the chronometers, and not to an improvement in the compensation. Now, it is true that I have attended personally to the adjustment of my chronometers all along; but this is no more than what every competent person probably attends to in the chronometers sent for trial to the Observatory. To suppose, therefore, that one maker should be able to produce chronometers which should singly beat from twenty to fifty others four years out of five, simply by the care he bestowed, would be to impute a degree of carelessness to the other makers, which Mr. Denison, if he were a practical man, and had to contend with them, would find there was very little ground for; yet he goes on to support this position by bringing forward the performance of a chronometer of the ordinary construction adjusted by Mr. Dent, and tried in 1829.

Now, I have a better knowledge of what chronometers do at the present day than of what they did three-and-twenty years ago, and will therefore compare the rate given of this chronometer with the rate of Mr. Dent's patent construction in the trials at the Observatory during the last five years. Referring then to the Table already given, we find the average error of his patent chronometer to be 12·2 seconds between one week and the next; and supposing the statement concerning the other chronometer only varying 0·54 seconds in twelve

months to be correct, it would appear that the patent construction, aided by twenty years' additional experience, varies twenty-two times more in a week than the ordinary construction did in a year.

If the instance adduced by Mr. Denison does not therefore prove what he intended it should, it at least shows something else.

Hitherto I have spoken only of the ordinary chronometer trials; but there have been other trials of my improvement, conducted by the Astronomer Royal, at the request of the Board of Admiralty, of a more important character as regards the secondary compensation. These were special trials instituted in 1845 and 1846, particularly to test the principle; and in order that the trials should be more severe than any to which chronometers had before been exposed at the Observatory, I voluntarily proposed that the chronometers should be immersed in freezing mixtures, in order to test the principle in much lower temperatures than occur naturally in this climate. Before this proposition could be carried out, one or two difficulties had to be overcome: in the first place, the Observatory was not furnished with the necessary apparatus; and in the second, the Astronomer Royal was unwilling to incur the risk of damage that might occur to the chronometers from the employment of freezing mixtures. Not wishing, however, to give up the most severe part of the trial, I forwarded suitable apparatus to the Observatory, and undertook the risk of injury to my chronometers from its use; and also to repair such damage as might occur to any other chronometers that should be submitted to the same test for the purpose of comparison. I also sent an apparatus for exposing the chronometers to artificial heat, in which high temperatures could be more steadily maintained than in the iron tray then employed at the Observatory.

The results of these trials were given by the Astronomer Royal, in two Reports to the Board of Admiralty; and as they may be found in a Parliamentary return, obtained by Sir George Pechell, in 1849, I need only insert the following extract from the first Report, with the *mean* of the temperatures to which the chronometers were exposed, from the second Report:

"Mr. Loseby attaches to the balances of his chronometers curved tubes containing mercury.

"It is evident that the mercury, in expanding with an increasing temperature, arrives in parts of the tubes inclined in different degrees to the radii of the balance, and therefore its successive expansions produce successive effects of different magnitude on the momentum of the inertia of the balance. And by giving different forms to the tubes containing the mercury, the law of the successive alterations of the momentum of inertia may be made to adapt itself to the law of alteration of the elasticity of the spring, whatever that law may be.

"I consider this contrivance (taking advantage very happily of the two distinguishing properties of mercury, its fluidity, and its great thermal expansion) as the most ingenious that I have seen, and the most perfectly adaptable to the wants of chronometers. I am not aware that it is liable to any special inconvenience."

Mean of the temperatures employed in the special trials of Loseby's secondary compensation at the Royal Observatory:

Fah.

13°	19°	52°	63°	79°	97°
14	38	54	71	86	106
18	49	59	78	97	112

I have before observed, that these trials, from their being instituted with the direct object of testing the principle, were of the greatest importance as regarded the secondary compensation; yet Mr. Denison omitted to notice them altogether; an omission not the less unjust from the fact of their being the only trials of a similar character which have taken place at the Observatory, much less that any other kind of secondary compensation has succeeded in them.

I may observe in conclusion, that Mr. Denison told us the other evening, my method of secondary compensation was not the best, and referred us to his Exhibition Report; but on looking there, I find he states that it is the best. If, therefore, he were recognised as any authority on horology, I might ask which opinion it was that he wished the public to believe?

SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

John Weems, of Johnstone, Renfrew, North Britain. *For improvements in the manufacture of metallic pipes and sheets.* Patent dated November 21, 1852.

This invention has relation to hydraulic machinery for manufacturing metallic pipes and sheets by forcing metal, such as lead, copper, &c., through dies or orifices. The construction of such machinery being generally well understood, it will only be necessary to point out the distinctive features of Mr. Weems' improvements. These consist in making the core-bar a fixture to the interior of the metal-receiver, so as to travel along with it, and thus reduce the frictional contact; in making the hydraulic ram and core-bar in a single piece; in the use of

steel or case-hardened metal, to resist compression when hard metals, such as copper, are being operated on; and in applying currents of water to keep the working surfaces and the compressed tubes or sheets in a cool state. In manufacturing sheets of metal by the hydraulic press, Mr. Weems first produces a tube, then opens it up and extends or flattens it by rolling, or he produces it direct in its finished form by compressing the metal through a suitable orifice.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn. *For improvements in the construction of springs for railway and other carriages.* (A communication.) Patent dated November 25, 1852.

The improvements claimed under this patent relate to the construction of springs of India-rubber for suspending railway carriages, for supporting carriage and other seats, and for traction springs.

The springs are in every case composed of rings, or washers of India-rubber, with alternate ones of metal, arranged in a cylinder or case, and having a rod passing through the centre, carrying a plate at the inner end, by which, on tension being applied to the rod, the India-rubber rings ar- compressed between the end of the cylinder and the plate on the rod. The amount of novelty in the arrangements is very questionable, except as regards the seat-springs; in which case the seat is supported on endless bands passing round small friction rollers, at opposite sides of the seat framing. The springs are inserted in the band, and their elasticity is brought into play, when the seats, which rest on the band, are depressed.

Moses Poole, of London, gentleman. *For improvements in the elastic ribs, sticks, strips, and fillets used in the manufacture of umbrellas, parasols, and various other articles in substitution of whalebone and steel, heretofore employed.* (A communication.) Patent dated November 27, 1852.

The improvements consist in manufacturing the ribs, sticks, and other parts of umbrellas and parasols, and the springs of corsets, &c., from the hard elastic material produced by combining India-rubber with sulphur, and submitting the compound to heat.

A patent has already been granted to Mr. Newton for the manufacture of the material on behalf of Mr. Goodyear, who is also the communicator of the present invention.

Claim.—The manufacture of umbrellas and parasols and various other articles (in substitution of whalebone and steel), from the elastic material produced by combining India-rubber with sulphur, and subjecting the same to heat.

Lewis Pocock, of Gloucester-road, Regent's-park, gentleman. *For improvements in rendering sea and other water pure.* (A communication.) Patent dated November 27, 1852.

This invention consists in a mode of purifying or freshening sea-water by the combined agency of chemical and mechanical operations. The apparatus employed consists of a still or evaporator of any approved form, which communicates, through an intermediate vessel, termed a cucurbite vessel, with a worm-condenser or refrigerator, the connection of the three being effected by suitable pipes. The mode of operating is as follows:—Sea-water is pumped into the refrigerator until it is nearly filled, and in order to effect the precipitation of the lime, magnesia, &c. contained in the water, in an insoluble state, hydrate of soda or potash is added in the proportion of 2 oz. to every 22 gallons of water. After standing about 25 minutes to allow precipitation to take place, the water is pumped into the still or evaporator, and a small portion into the intermediate vessel. The fire is then lighted in the still, and distillation commences. The vapour passes from the still into the intermediate vessel, where it parts with any impurities carried over with it, and from thence to the worm in the refrigerator, where it is condensed. The distilled water will be found to possess the usual flat vapid taste but no empyreumatic flavour, owing to the precipitation of the greater part of the organic bodies contained in it previous to its distillation. To deprive it of its vapidity and render it palatable, hypochlorite of lime, or chlorine water, is added in the proportion of 4 to 20 grains to every 22 gallons, and it is agitated and exposed to atmospheric air, after which it is filtered through animal or vegetable charcoal, and thus brought to a condition fit for domestic and other purposes.

The claim is for the combined apparatus and process described, whereby the water is chemically treated previous to distillation, then distilled, caused to traverse an intermediate vessel, condensed, and finally treated as described.

William Gorman, of Glasgow, Lanark, engineer. *For improvements in obtaining motive power; which improvements, or parts thereof, are applicable for measuring and transmitting aëriform bodies and fluids.* Patent dated December 8, 1852.

The patentee describes and claims,

1. The employment of the waste heat of the products of combustion from furnaces for the purpose of heating the air supplied to such furnaces for supporting combustion.

2. The interposition of any medium ca-

pable of absorbing and retaining heat between the flame of a furnace and the sides of the steam-generator heated thereby.

3. A mode of generating steam by bringing surcharged or highly-heated steam in contact with surfaces confining or enclosing minute quantities of water.

4. Several constructions of rotary engines, in which the steam is admitted at the periphery, and acts against vanes or blades in a suitable casing, escaping at the centre of the wheel.

5. The construction of rotary machines for various purposes, having several vents arranged round the periphery of the casing, for the escape of the fluids, &c., directly on leaving the blades, thus securing the advantages of centrifugal action and tangential escape.

6. A peculiar arrangement of double valves for rotary machines.

English Specification Due, but not Enrolled.

PIERRE JULES LAMAILLE, of Paris, France, manufacturer. *For certain improvements in the preservation of japanned leather.* Patent dated December 1, 1852.

PROVISIONAL PROTECTIONS.

Dated May 17, 1853.

1218. Samuel Eccles and James Eccles, of Kensington, Philadelphia, Pennsylvania. Certain improvements in power looms for weaving figured fabrics.

Dated May 25, 1853.

1275. William Dabb, of Gray's-inn-road, Middlesex, gentleman. Improvements in the manufacture of hair trimmings.

1277. William Church, of Birmingham, Warwick, gentleman. A new or improved sight for cannons or other ordnance.

1279. Frederick Russell, of Clarence-gardens, Regent's-park, Middlesex, mechanic. Improvements in raising and lowering windows, shutters, blinds, and similar appendages.

1283. Samuel Sanderson Hall, of the Circus, Minories, London, ship-broker. Improvements in the means of preventing railway carriages running off the rails. A communication.

1285. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the generation of steam. A communication.

Dated May 26, 1853.

1288. Alexander Porecky, of Bishopsgate-street Within, London, gentleman. Improvements in the manufacture of umbrellas and parasols.

1289. Thomas Singleton, of Over Darwen, Lancaster, hat and cap dealer. Improvements in looms.

1291. George Simpson, of Manchester, Lancaster, machine-maker. Improvements in weighing-machines.

1292. William Rascter, M.A., mathematical master at the Royal Military Academy, Woolwich, Kent. Central-action buffers and spring guides for traversing-rods.

1293. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. Improvements in the manufacture of iron. A communication.

1294. William Warcup, of Lyndhurst Villa, Coronation-road, Bristol, Somerset, contractor. Improvements in the construction of springs for carriages, and similar purposes.

1295. Alphonse Rene le Mire de Normandy, of Judd-street, Middlesex. Improvements in regulating the pressure of steam.

1296. Jonathan Saunders, of St. John's Wood, Middlesex. Improvements in the manufacture of railway and other wheel-tyres.

1297. Theophilus Westhorp, of West India-road, Poplar. Improvements in the manufacture of oakum.

1298. William James Harvey, of South-street, Exeter, gun-maker. Improvements in fire-arms.

1299. John Box, of Rue Pepinière, Brussels, Belgium, furnishing engineer. Improvements in supplying water to steam-engine boilers. Partly a communication.

1300. William Weatherley and William Jordan, of Chartham, Kent, engineers. Improvements in the stuffing-boxes of piston-rods.

1302. Julius Augustus Roth, of Philadelphia, Pennsylvania, chemist. Improvements in the mode of, and machinery for, treating the fibres of flax, hemp, China grass, and other analogous substances preparatory to spinning. Partly a communication.

Dated May 27, 1853.

1303. William Henham, of East Peckham, Kent, farmer. Certain improvements in ploughs.

1304. Samuel Smith Shipley, of Fowkes-buildings, Tower-street, London, Middlesex, Esq. Improvements in cases or receptacles for containing a composition shaving-soap or other articles.

1305. Claude Arnoux, of Rue du Mont Parnasse, Paris, France, administrator of the Messageries Générales. Certain improvements in the construction of locomotives.

1307. John Lee Stevens, of King William-street, London, civil engineer. Improvements in furnaces.

1308. Alexander Keiller, of Dundee, Scotland, confectioner. An improved machine for the manufacture of confections, including all kinds of comfits known by the trade as pan goods.

1310. William Henry Bentley, of Bedford, whitesmith and engineer. Improvements in locks and keys, parts of which are applicable to window-sashes and doors.

Dated May 28, 1853.

1311. Illingworth Butterfield, of Bradford, York, manager. Improvements in and applicable to looms for weaving.

1315. Richard Archibald Brooman, of the firm of Robertson, Brooman, and Co., of Fleet-street, London, patent agents. Improvements in abdominal supporters. A communication.

1316. Caleb Hill, of Cheddar, Somerset, stay-manufacturer. Improvements in the construction of stays.

1317. François Francillon, of Puteaux, France. Improvements in dyeing and printing silk, wool, and other animal fibres.

1318. Daniel Bateman, of Low Moor, near Bradford, York, card-maker. Improvements in carding wool and other fibrous substances, and in the manufacture of cards for that purpose.

1319. Christopher Binks, of Albert Villa, North Woolwich, Kent. Improvements in manufacturing chlorine, and in obtaining certain salts and other useful products from the residual matters of lush manufacture.

1320. William Walker Marston, of New York, United States of America, gun-manufacturer. Improvements in breech-loading fire-arms, and in cartridges for use with such arms.

1323. Alfred Whaley Sanderson, of Cable-street, Lancaster, tea, coffee, and spice merchant. Improvements in preparing effervescing powders.

Dated May 30, 1853.

1327. John Macdonald, of Henry-street, Upper Kennington-lane, Vauxhall, Surrey, machinist. Improvements in and applicable to lamps, also applicable to apparatus for lighthouse signal purposes, part of the invention applicable for other useful purposes.

1328. Francis William Wymer, of Newcastle-on-Tyne, Northumberland, engineer. Improvements in raising and lowering ships' boats, and in the apparatus connected therewith.

1329. Julian Bernard, of Guildford-street, Russell-square, Middlesex, gentleman. Improvements in obtaining differential mechanical movements.

1331. John Champney Bothams, of Vine Cottage, Londonderry-road, Camberwell Green, Surrey. Improvements in condensing steam engines.

1333. John George Appold, of Wilson-street, Finsbury-square, Middlesex, fur-skin dyer. A new construction of screw propeller.

Dated May 31, 1853.

1334. William Brookes, of Chancery-lane, Middlesex. Improvements in stoves and grates or fire-places. A communication.

1335. William Frederick Shoebridge, of Thames Cottage, East Greenwich, Kent. Improvements in the manufacture of drain-pipes.

1336. George Goodlet, of Leith, Midlothian, Scotland, postmaster. Improvements in engines to be worked by steam, air, or air and water combined.

1338. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved construction of hand-stamp. A communication.

Dated June 1, 1853.

1339. Joseph Morris, of Astwood Bank, near Redditch, Worcester, manufacturer. An improvement or improvements in the manufacture of envelopes for needles.

1341. Alfred Hardwick, of Chatham-street, Liverpool, Lancaster. Improvements in propelling vessels.

1342. Thomas Aitken, of Bury, Lancaster, cotton spinner. Improvements in furnaces for steam boilers and other purposes.

1345. Maxwell Scott, of Birkenhead, Chester, engineer. Improvements in propelling.

1346. James Stocks, junior, of Ovenden, Halifax, York, manufacturer. Improvements in looms for weaving.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June* 10*th*, 1853.)

36. Robert Whinery. Certain improvements in or upon the manufacture and treatment of leather, either alone or in combination with other materials.

97. Joseph Lillie. Improvements in machinery to be used in the process of malting, drying, and seasoning grain, including certain vegetable and other substances.

(*From the "London Gazette," June* 14*th*, 1853.)

148. George Carter. Improvements in the construction of furnaces.

176. William Nairne. Improvements in dressing yarns for looms.

178. William Kendall. Improvements in the manufacture of boxes and similar articles, and in the machinery or apparatus to be employed therein.

181. Andrew Edmund Brae. A method of communicating signals from one part of a railway train to another.

210. Robert Shaw. Starting, stopping, and reversing steam engines.

244. Thomas Knox. A new or improved rotatory heel for boots and shoes.

317. Thomas Peacock. Certain improvements in weaving, and in machinery for weaving hat-plush and other cut-piled fabrics.

334. Richard Archibald Brooman. Improvements in sail-hanks for securing stay-sails, jibs, and other sails to their proper stays. A communication.

392. Frederick Chinnock. Improved means of securing axles in their boxes. A communication.

413. James Murphy. Improvements in the permanent way of railways.

492. Robert Griffiths. Improvements in propelling vessels.

531. Charles Humpage. The application of certain materials to the manufacture of coffin furniture.

809. William Willcocks, Sleigh. The production of motive power, which he entitles "the counteracting reaction motive-power engine."

841. Leopold Joseph Green. Improvements in axletree-boxes.

910. William Ogden. A certain improvement or improvements applicable to carding-engines used for carding cotton, wool, and other fibrous material.

994. William Johnson. Improvements in the means of retarding and stopping railway trains. A communication.

1033. William Hurt Sitwell. Improvements in projectiles for cannon and fire-arms.

1183. William Thomes. Improvements in weaving narrow fabrics for binding.

1212. George Jones. Improvements in ventilating mines.

1225. Charles Clarkson. An improved duster or dusting-brush, painting-brush, and all other description of brushes, the handle of which passes through the centre, and the hair or bristles are bound or tied round it.

1240. John Hippisley. Improvements in steam engines suitable for agricultural purposes, and to locomotion on common roads.

1248. Edward Jones Schollick. Improvements in obtaining motive power.

1249. Samuel Schollick. Improvements in ship-building.

1252. Thomas Isaac Dimsdale. Improvements in purifying coal-gas, and in disinfecting sewage or other fetid matters, and in absorbing noxious gaseous exhalations.

1266. William Simson. Improvements in locks.

1283. Samuel Sanderson Hall. Improvements in the means of preventing railway carriages running off the rails. A communication.

1285. William Edward Newton. Improvements in the generation of steam. A communication.

1286. Jonathan Dodgson Carr and John Carr. An improved construction of oven.

1287. William Haslett Mitchel. Improvements in means for distributing and composing types.

1293. Charles Cowper. Improvements in the manufacture of iron. A communication.

1294. William Warcup. Improvements in the construction of springs for carriages and similar purposes.

1295. Alphonse Rene le Mire de Normandy. Improvements in regulating the pressure of steam.

1297. Theophilus Westhorp. Improvements in the manufacture of oakum.

1298. William James Harvey. Improvements in fire-arms."

1299. John Box. Improvements in supplying water to steam-engine boilers. Partly a communication.

1308. William Henham. Certain improvements in ploughs.

1304. Samuel Smith Shipley. Improvements in cases or receptacles for containing a composition shaving soap or other articles.

1318. Daniel Bateman. Improvements in carding wool and other fibrous substances; and in the manufacture of cards for that purpose.

1334. William Brookes. Improvements in stoves and grates or fire-places. A communication.

1338. William Frederick Shoebridge. Improvements in the manufacture of drain-pipes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1347. Admiral the Earl of Dundonald, of Belgrave-road, Middlesex. Improvements in apparatus for laying pipes in the earth, and in the junction of such pipes. June 1.

1376. John James Kerr, lieutenant R.N., of Gloucester Grove West, Old Brompton. Improvements in the manufacture of cartridges. June 4.

1400. Thomas Davis, of West Bromwich, Stafford; Boaz Bloomer, of Dudley, Worcester; and Boaz Bloomer, junior, of Pelsall, Stafford, ironmaster. Improvements in the manufacture and piling of iron to be used in the production of railway chairs. June 7.

WEEKLY LIST OF PATENTS.

Sealed June 10, 1853.

1852:

1020. Richard Archibald Brooman.
1033. Charles Ritchie.
1067. Charles James Wallis.
1076. John Healey.
1140. John Moore Hyde.
1204. Julius Singer.
1211. James Lord.

1853:

96. John Walker Wilkins.
145. George Edouard Gazagnaire.
209. Casimer Noël.
238. Lewis Jennings.

Sealed June 11, 1853.

1852:

1028. Archibald White.

Sealed June 13, 1853.

1037. Joseph Hamblett and William Dean.
1042. Jules Lejeune.
1059. Joseph Paul Marc Floret.
1073. André Contry.
1098. George Thomson.
1110. George Lingard.
1141. Alfred John Hobson.
1143. Alexander Deutsch.

1853:

456. Edwin Stanley Brookes, Joseph Black, George Stephenson, and William Jones.
763. Christopher Nickels.
827. William Radford.
857. Herbert Taylor.
874. Henry William Harman.
883. John Smith.
884. Alfred Vincent Newton.
889. Thomas Edwards.
929. William Walker Stephens.
962. Henry Carr.
996. Isaac Brentnall Sheath.
1017. George Critchley.
1026. William Frederick Thomas.

Sealed June 16, 1853.

1852.

1077. Richard Blades.
1080. Thomas Motley.
1081. Auguste Edouard Loradoux Bellford.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

W. H. R., Newcastle.—We feel convinced from the statement of facts which you have submitted to us, that the patentee would have a right of action against you for infringement, if you make use of his arrangement. The law does not take cognizance of the fact of the plumber having applied the invention to chemical purposes, as the patent is for the application to paper-making. Had the plumber's application been to this manufacture, and of a prior date to that of the patent, then the patent might have been invalidated. In a chemical manufacture you would probably have been free. As a general rule, some doubt attaches

to the validity of patents which are simply for the application of a known principle; but we would not counsel you to incur the risk and vexation of a suit at law, in preference to complying with the terms of the patentee, however exorbitant they might be.

WORKS ON MILL ENGINEERING.

SIR,—Having examined the catalogues of our extensive booksellers, I am unable to discover any English work which treats of the practical arrangement of the machinery of flour and grist mills, and the very peculiar action of some of the machines employed therein.

I allude particularly to the original setting out and subsequent dressing of the grinding surfaces of mill-stones; the size and directions of the furrows; the centring and setting of the stones on the spindles; their grinding action and discharge of the meal; the action of bolting-machines; the inclination of their axes to the horizon; their angular velocities, diameters, &c., &c.

I should feel greatly obliged by being informed whether there is any *sound* work on those subjects accessible in the English language; and if so, where it may be procured.

I may add that I have just looked over a small work designated the "*American Miller*," by W. C. Hughes, and sold in this country by the importers of American books: it seems a strange compound of error, absurdity, and *go-ahead* useful information; but as a book of reference, it is much worse than useless in the hands of a merely practical man.

May 28th, 1853. MILLWRIGHT.

We are not acquainted with any work precisely of the kind referred to by our correspondent. In Tredgold's "Steam-machinery" some fine examples are given, particularly of the mills made by the Messrs. Joyce, of Greenwich, for Smyrna. "The Young Millwright and Miller's Guide," 30th edition, Lea and Blanchard, Philadelphia, 1850, is a very excellent work, which embraces the general subject of mill-engineering; but even this work is certainly better adapted for a new country than for this. This work might probably be had at Weale's, Holborn.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
June 3	3471	J. Gillott	Birmingham	Pen-holder.
4	3472	C. A. and T. Ferguson	Poplar	Hawse-plug.
10	3473	P. Tait	Limerick	Shirt.
11	3474	H. Olden	Birmingham	Silk preserver for work-tables.
,,	3475	F. Edwards	Poland-street	Heat-conductor.
15	3476	A. Sharland & J. Gotley.	Bristol	Pressure-pump.

WEEKLY LIST OF PROVISIONAL REGISTRATIONS.

June 9	518	J. Ellisdon	Liverpool	Reclining chair.
11	519	W. Duckworth	Liverpool	Window-guard.
,,	520	Flanagan and Co.	Liverpool	Hat.

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LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1559.] SATURDAY, JUNE 25, 1858. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

BOUTIGNY'S PATENT DISTILLING APPARATUS.

Fig. 1.

Fig. 2.

BOUTIGNY'S PATENT DISTILLING APPARATUS.

(Patent dated December 18, 1852.)

The principle of the apparatus for which M. Charles Constant Boutigny, of Evreux, has taken out this patent, consists for the most part in the condensation of the vapours almost at the instant of their formation; so as to insure the conversion into a fluid state of the entire volume of volatile matter. Another feature in the invention is the caution observed in preventing any of the matters under distillation from boiling up and becoming mixed with the vapours. For this purpose the inventor places above them a grating sheet of wire gauze, perforated plate, or similar intercepting medium, in one or more layers, which, while intercepting the substances themselves, admits of the free passage of the vapours arising from them. For the distillation of wines and other spirituous liquids, the inventor combines in a series several of the arrangements about to be described, in such a manner that the product distilled from the first apparatus shall serve to feed the second, and so on in succession; the last apparatus in the series leading into a refrigerating coil, or other description of refrigerator. He thus obtains liquids of different densities in the several vessels, but of uniform density in each condenser separately. The liquid to be distilled forms the refrigerating liquid in passing from the condenser of the last apparatus; that is to say, from that in which the liquid is most rarified to that which is least, and so on in succession, until it reaches the first generator, which it supplies, and the condensed vapours of which feed alternately the others in the series.

In distilling, however important it is to present a large evaporating surface to the fire, it is equally important to condense the vapours formed as rapidly as possible, bearing in mind that the vapour of water at 212° Fahrenheit, and under the pressure of one atmosphere, fills a space about 1,700 times greater than that produced from water at 32°. In this apparatus, and in the process depending upon it, a large heating surface and rapid condensation are obtained. The evaporator may be heated by the direct action of fire, by steam, or by gas, at any required pressure, and under any temperature.

Fig. 1 is a sectional elevation of an apparatus on Mr. Boutigny's principle, constructed for the distillation of spirituous liquors, and if necessary for the rectification of the product by the addition of a second and similar apparatus. A, A, A, is a metal boiler or cucurbit, which he denominates a "Generator;" B, B, B, a refrigerator, which he calls a "Condenser," filled with cold liquid, and accurately closed, upon the under surface of which the vapour arising from the generator, A, A, A, becomes condensed; C, C, C, is a funnel-shaped vessel, the upper edge of which is above the level of the liquid in the generator, and which receives the vapour condensed by the under surface of the condenser; D is a cock for emptying the generator; E E, a pipe leading from the bottom of the receiver for carrying off the condensed vapours; F F, a feed-pipe for keeping up a constant supply, which pipe opens into the branch, I I, closed at top and open at bottom.

The pipe, E E, which receives the distilled liquid from the first apparatus, becomes a feed-pipe to a second apparatus, precisely similar to that shown at fig. 1 (but which it has not been considered necessary to represent), and opens into the branch similar to that shown at, I I; J, is an indicator tube, showing the level of the surface of the body under distillation; L L, are the flues of the furnace for the passage of flame, smoke, and heat; M, is the supply-pipe, leading from a reservoir into the refrigerator; O O, are regulating cocks; U U, the perforated diaphragm, or layer of wire gauze, for preventing the liquid during ebullition from passing over with the vapours into the receiver.

Fig. 2 is a sectional elevation of a modification of the apparatus first described, and particularly applicable to the distillation of fatty matters.

Experiments have shown that the distillation of those bodies takes place in a direct ratio to the quantity of steam injected into them. By means of the present apparatus the operator is enabled to inject steam in as great quantities as may be desired, with the certainty of its mixing with the fatty bodies under distillation, which it reduces to the particular molecular state assumed by acids obtained from distillation.

A A, is the generator, the under surface of which is in the shape of the bottom of a bottle; B, B, B, the condenser supplied with tepid water, on the under surface of which the fatty vapours become condensed; C, C, C, the receiver, into which the condensed vapours fall, and from which they are conducted by the pipe, D, D, D, into a refrigerating coil, or other refrigerator, where they are finally condensed; E E, is an annular copper pipe perforated for the escape of steam supplied through the branch pipes, F F; G G, is another perforated annular pipe through which the fatty matters are forced by a pump, connected with the supply-pipes, H H, and whereby they are thrown down upon *dividing*

substances in the bottom of the alembic; J J, is a jacket for containing sand for maintaining a uniform heat in the generator; L L, are flues; M, the furnace; N, the water-supply pipe; and O, the overflow pipe.

The apparatus may be modified by fixing on the condenser a "head," as in a common still, which may be made to communicate with a refrigerating apparatus, whereby fatty acids and spirituous liquids may be distilled in one and the same apparatus; the spirituous liquids acting as condensing liquid, and rising at the same time to a degree of temperature necessary for their distillation. It is of course requisite, in such cases, to act on bodies which boil at different temperatures.

THE COMPOSITE COURSE BY MOORE'S INDICATOR.

In giving an account of Captain Moore's great circle indicator in our last number, and of the principles upon which its construction and mode of working proceed, we called attention to the solution of the modified form of the general problem of the great circle through two points, in which it was necessary partially to abandon the great circle course, and to seek another which should be limited to a lower latitude. As an illustration of this nautical necessity, and of the manner in which it was met, we supposed the passage from the Cape of Good Hope in latitude 34° south, and longitude 18° 29′ east, to Cape Otway, in latitude 38° 54′ south, and longitude 143° 30′ east, and we explained, that as the great circle passing through these two capes, went as high as the 59th degree of latitude, or within 32 degrees of the South Pole, and on that account was frequently impracticable from physical causes, the mariner gave up the great circle course through that part of its arc which was intercepted by the parallel to which he proposed to confine himself, and which for our purpose we assumed to be 50°. This, as we are informed, is the principle of the passage known as the "composite course;" and as it involves a long run upon a small circle, viz., the parallel of 50°, it is obviously a large sacrifice of distance, and also of time. In this state of facts, we pointed out the advantage of two arcs of great circles; one passing through the Cape of Good Hope, and the other through Cape Otway, and both through the same point in the 50th parallel. Proceeding upon that principle, we stated that the 86th meridian east from Greenwich would intersect the 50th parallel near the point at which the pair of great circular arcs should unite, in order that their sum should be the least possible of all the pairs of arcs that could be so drawn. This is the mathematical solution of the general problem of finding two great circular arcs, both commencing at the same point in parallel 50°, and terminating respectively in the two Capes proposed as the beginning and end of the voyage, such that the voyage made upon them should be the shortest possible. In solving this problem of minimum arcs, however, the solution does not take notice of the latitude into which the arcs so drawn may lead; and upon a re-examination of it, we find, that though the mathematical conditions are complied with, the nautical ones are transgressed, and the ship led into a higher latitude than 50°.

From the nature of the great circle, any other mode of sailing from the Cape of Good Hope to Cape Otway, without going into a higher latitude than 50°, must necessarily be longer than this; but still this disadvantage must be incurred. As no part of the great circles employed, therefore, must pass the 50th parallel, it is obvious that they must simply touch it; and the question simply reduces itself, in the first instance, to the determination of the longitude of the point of contact of each. Now it is easily shown, that as this point of the great circle will be that in which it approaches nearest to the pole, and therefore that the circle there intersects at right angles the meridian which passes through it, this consideration furnishes us with the principle upon which the determination of the true composite course must turn. First, for the determination of the primary course from the Cape, we have the complement of its latitude, or 55° 38′ (taking the latitude of the Cape to be 34° 22′), forming the hypothenuse of a right-angled spherical triangle, one side of which is 40°, the complement of 50°. Solving this triangle by the analogies of Napier, we obtain the difference of longitude between the Cape and the point of contact of the departure great circle to be 54° 59′, making the longitude of that point 73° 28′. Proceeding in a similar manner with the right-angle triangle, of which the co-latitude of Cape Otway forms the hypothenuse, we find 47° 23′ to be the difference of longitude between that Cape and the point of contact of the arrival great circle, the longitude of which will consequently be 96° 7′; the difference here being subtractive. Now the sum of the two differences of longitude is 102° 22′; and as the whole difference of

longitude between the Cape of Good Hope and Cape Otway is 125° 1′, there is a remainder of 22° 39′, which is not made up by the two great circular arcs. This difference of longitude must be run upon the parallel of 50°, and will be found to be very considerably less than the arc of the same parallel intercepted by the great circle between the Cape and Cape Otway. Solving the other unknown parts of the right-angled triangles, the elements of which have been already stated, we find that the ship's course on leaving the Cape will be S. 50° 59′ E., and that the length of the arc of the great circle she describes in passing to latitude 50° and longitude 73° 28′, will be 42° 32′. The length of the arrival-arc will be 34° 57′, and the ship's course at Cape Otway N. 55° 41′ E.

This form of the problem admits of an easy and accurate solution by Captain Moore's great circle indicator, which will be found to give results coinciding with those stated above. All that is necessary is to construct the right-angled triangles involved in the operation. For this purpose a great circle must be passed through the latitude of the Cape of Good Hope on one meridian, and through latitude 50° on another. The latter meridian must then be moved until it intersects at right-angles the great circle through the Cape. It is obvious that the difference of longitude, the length of the arc, and the ship's course at the Cape, can be determined by simply reading off the values of the unknown numbers of this triangle. Clamping the great circle through the Cape, and then shifting the meridian of the Cape, its successive angles of intersection with the latter circle in its successive positions, will show the ship's course in any given longitude. Having completed the departure great circle in this manner, the ship's course will be due east, or exactly coincident with the parallel of 50°, at the moment of entering it. The captain will now construct the triangle for the arrival arc, and will continue on parallel 50° until he reaches the longitude of the point of contact of the arrival arc. When this longitude is reached, he deviates gradually from the easterly course, and, guided by the indications of the instrument, worked in the manner already pointed out, he will reach Cape Otway upon the arrival great circle. The length of this course in nautical miles is as follows:—The departure great circle, measuring 42° 32′, calculated at 60 miles to the degree, is 2,552 miles; the arc of the parallel of 50°, measuring 22° 39′, calculated at 38·57 miles for a degree of longitude, is 873·6 miles, and the arrival great circle, measuring 34° 57′, is 2,097 miles; making a total of 5,522·6 miles, or only 75 miles longer than the double great circle course meeting in parallel 50°. This solution conforms to all the requirements of the case, and has the advantage of being perfectly easy, both mathematically and by construction, over the other, which probably admits only of an approximative solution. This property, however, may be shown to belong to the arcs and angles concerned in the double great circle course,—that the sines of the angles into which the difference of longitude of the two places is divided by the meridian passing through the point of junction in parallel 50°, are proportional to the sines of the departure and arrival arcs.

It is curious to observe, on this subject, that the course we have above pointed out, and of which we have described the solution by Captain Moore's instrument, is precisely that which would result from an attempt to find the course mechanically. If we took a globe, and inserted short pins firmly into its surface at the Cape of Good Hope and at Cape Otway, and then stretched an elastic band between those pins, the elasticity of the band would cause it to take the shortest distance between them—that is, the great circle. We should then be able to observe that that circle passed into a degree of latitude too high for the seaman in adverse seasons, and supposing, as we have already supposed, that the 50th parallel is not to be exceeded, the mode in which our construction must be adapted to this supposition, would naturally be this. We should prepare a short circular arc, having the same curvature of that parallel, so as to fit it when applied to it. The mode of preparing that circle is extremely easy. It is only necessary to draw on paper a circle having the same radius as the globe used, and to plot off upon it, by a protractor, an arc of 50°. Draw a radius through one extremity of the arc, and through the other draw a perpendicular upon that radius. The portion of the radius included between the centre and the place where the perpendicular falls, will be the radius of the arc required. Having made it, it must be used to remove the band forcibly out of its position of rest. In the present case, it must be applied to the south of the band, and the band must be pushed northward before it until the arc reaches parallel 50°. It will then be found that a portion of the band will rest against the card, between the degrees of longitude specified above, and that arcs of great circles at either end will connect its extremities with the Cape and Cape Otway. By calculation, and by Captain Moore's indicator, this course can be more conveniently and more accurately determined; but the

mechanical construction on a solid globe, is exceedingly useful as an illustration of the conditions and principle of the problem.

Great circle sailing is a curious and highly interesting subject, eminently calculated to lead to correct ideas of the approximate figure of the earth, considered as a sphere, and its properties. Mr. Wyld's great globe, which has already done so much for the study of geography, may conduce in as high, or a still higher degree, to the popular development of this subject. Thus the great circle between the Cape of Good Hope and Cape Otway might be indicated by the shadow of a string stretched between temporary suspension points formed by rods touching those places, and projected by a light in the centre of the sphere; or, as that point might be inaccessible, by a light placed in the plane passing through the card and the centre. The composite course might also be illustrated with great advantage in this fine work, and the comprehension of the whole subject immensely facilitated. As great circle sailing is a matter of as great popular interest as practical importance, we should be glad to find the illustration of its nature advanced by any familiar mode of demonstration, fully satisfied that on this depends its extensive and successful adoption in practice. Captain Moore's invention has stripped it of all practical difficulty. All that remains, therefore, is to pave the way for the comprehension of the principle, and for this purpose mechanical illustrations must be resorted to of the kind we have ventured to suggest.

Singular case of Spontaneous Combustion.—In making the excavation for the lock on the Hove Ship Canal, near Brighton, a quantity of shale, of a blackish colour, which was thrown out, spontaneously ignited. The stratum of shale is about 8 feet in thickness; the quantity thrown out is therefore large; and the whole of it, extending over a space of some score of square yards, gives signs of approaching combustion, while in many parts it is already burning like a limekiln, so that it has been removed from around the piling, for fear of its being destroyed. The process of combustion gives out a stifling and offensive vapour, and leaves upon the surface a deposit of a white colour, and also of a yellow substance; the former resembling saltpetre in appearance and taste, and the latter sulphur. A small quantity of shale, evidently forming a part of the same stratum, has been thrown up from under the clay in a brick-ground near the Chalybeate, at Brighton, about three miles distant from the lock, and this has also ignited.

SIR JOHN ORDE'S PATENT HEAD-GEAR FOR HORSES.

(Patent dated December 8, 1852.)

The improvements in the construction of the head-gear for horses, "and other like animals," described in the specification of Sir John Orde, include a method of constructing bits, or bit-bearers, and of securing them in the mouth of the animal, whereby the cheek-straps of the bridle may be dispensed with, the bit or bit-bearer being held and kept in the mouth by means of what the patentee terms a "back-branch," suspended from a throat-lash, or neck-strap.

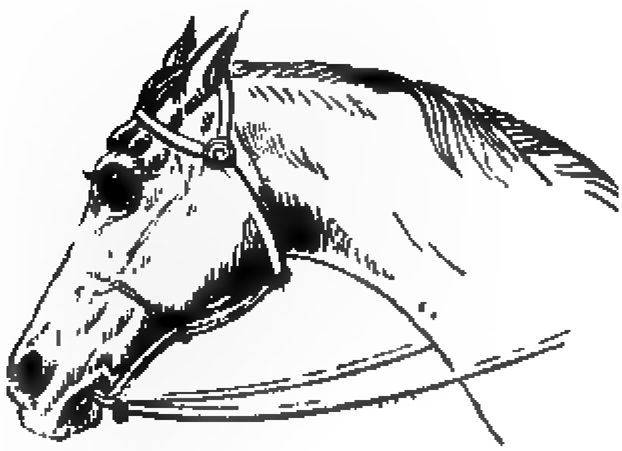
The bit or bit-bearer is made from a ring, or portion of a ring, either round, or of any other shape suited to embrace the lower jaw of the animal, and going behind it nearly in the place where the common curb-chain is usually applied. From the back of this ring, or portion of a ring, either immediately or by the back-branch, the bit or bit-bearer is suspended to the throat-lash of the bridle or other head-gear, and is attached to it by a strap-chain, or other contrivance. The back-branch may be made of various lengths, but the patentee prefers that it should be generally from one to three inches.

Figs. 1, 2, and 3 are perspective views of different constructions of bits with Sir John Orde's improvements. Fig. 1 represents a plain ring-bit; A is the mouth-piece, or bit-proper; B the back-ring, and C the back-branch by which the bit is suspended. Instead of this back-branch a plain eye might be used, but the patentee prefers to employ the back-branch. Fig. 2 represents a curb-bit, with an eye formed in the back-ring, B, for the purpose of suspending it from the throat-strap of the head-gear. Fig. 3 is a similar curb-bit, having the back-branch, C, attached.

Figs. 4 and 5 show a plain ring-bit and a curb-bit, on the principle of the patent, as worn by a horse.

Fig. 6 represents one of Sir John Orde's bit-holders, adapted for being used with any kind of bit. B is the back-ring, the ends of which are turned up, as shown in the drawing, or may be otherwise suitably formed to receive the bit to be used, and hold it securely in the mouth of the horse. C is the back-branch, for which an eye may be substituted. Fig. 7 is another bit-bearer, with eyes or slits at the side in which the snaffle, D, is fitted. Fig. 8 represents a billet-strap for connecting the bit or bit-bearer to the throat lash. A strap of this kind will be used for the purpose where the bit or bit-bearer has a back-branch, or only a plain eye to suspend it. The form of mouth-piece, or bit-proper, in bits of this construction, may be greatly varied, and any approved form may be used in connection with the improved bit-bearers. Plain ring-bits have been used before, but they have always been suspended by cheek-straps at the sides; while the addition of the back-branch, according to this invention, enables the use of the cheek-straps to be dispensed with, and the bit to be suspended from the throat-lash, whereby the rider or driver obtains additional control over the animal.

Fig. 4. Fig. 5.



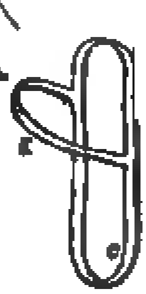
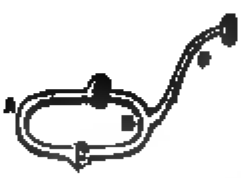
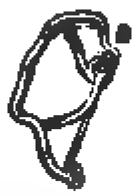


Fig. 9.

Fig. 6.

Fig. 8.





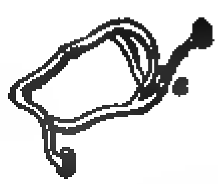


Fig. 1. Fig. 2. Fig. 3. Fig. 7.

The second portion of Sir John Orde's invention refers to an improved headstall to be used in connection with his bits or bit-holders as a bridle-head, or to tie up a horse securely in a stable or elsewhere. The headstall is made with one band passing across the forehead, and another band somewhat shorter, which passes over the head behind the ears, the two bands uniting below the ears with one throat-lash, from which the bit or bit-bearer is hung or the collar-rein led. Fig. 9 represents this arrangement. E is the forehead-band. F the head-band, which passes behind the ears of the animal; and G the throat-lash. The bands of the headstall may be made of leather, cord, or may be a chain, or the headstall may be composed of a metal-wire framing, which may be covered with leather, plated, or otherwise concealed or ornamented, &c. In any case buckles, knots, or other suitable fastenings must be applied for the purposes of opening and closing it. Figs. 4 and 5 show the headstall as worn by a horse in connection with bits constructed with these improvements.

THE IRON TRADE.

Birmingham.—There has been no improvement in the iron trade during the past week; but so far as the mills and forges are concerned the trade is good, and exhibits no symptom of a decline. There are, however, great doubts entertained as to the maintenance of prices, and this is attributed by some to underselling, now carried on to a great extent, and to "the continued exhibition by some of the ironmasters themselves of distrust in their own position." It cannot however be said of the first firm in the district that they have in any way failed to exact last quarter-day's prices; nor will they, unless the trade should determine upon a reduction at the preliminary meeting of ironmasters, which is to be held on the 30th of the present month. It is notorious that some of the smaller and more needy masters have been selling at from 20s. to 30s. under last fixed rates, so that a general opinion prevails that in spite of the opposition of some great makers, a reduction will be declared upon manufactured iron. According to one authority, upon which we have been accustomed to place reliance, at the present price of pigs manufactured iron will bear a reduction; but of that, of course, the ironmasters are, or ought to be, the best judges. In 1845, 1846, and 1847, coal was 1s. per ton cheaper than it is at present, and colliers' wages the same as now. Such was the case at that time in reference to the iron trade, so that a reduction in the price of iron and coal may take place without interfering much, if any, with the price of labour. The same authority says, one thing is quite certain that the demand for sheets and rails is good, and the future prospects of the iron trade are very cheering if the masters will be satisfied with fair and remunerating prices. There is wanted for railway and other purposes a vast amount of iron, and, if the prices are fairly regulated, continued prosperity may be anticipated.

Glasgow Pig-Iron Market.—Glasgow, June 18.—We have experienced considerable fluctuation in pig-iron during the past week, caused principally by the conflicting accounts received of the state of matters between Russia and Turkey. Prices ruled from 51s. to 53s.; and, except on Wednesday, when some 10,000 tons were done, business has been limited. To-day we close quietly; m. n. warrants, 53s. cash; No. 1 g. m. b., 54s. 6d.; Glengarnock, 55s.; Gartsherrie, 57s.

America.—We learn by the United States mail steam-ship *Atlantic*, which arrived at Liverpool on Tuesday evening, with advices from New York to the 11th inst., that Scotch pig-iron in the market of that city was quiet at 28 dollars cash, and 30 dollars six months.

EXPERIMENTS WITH NEW LIFE-BOATS.

During the present month an interesting series of experiments was instituted at Limehouse, with four new life-boats, built by Messrs. Forrest, for the Royal National Institution for the Preservation of Life from Shipwreck, which are to be stationed at Aldborough, Suffolk; Sennen Cove, Land's End; Barmouth and Cemlyn, on the coast of Wales. They are built from designs furnished by Mr. Peake, assistant-master shipwright at her Majesty's dock-yard, Woolwich, and vary in length from 25 to 32 feet, and are to be pulled double banked. They are clinch built. In lieu of great breadth of beam, the boats possess stability from straight sides and long flat floors, and on trial, it required a large number of men standing on the gunwale of each boat before it could be brought down on a level with the water. The boats are fitted internally with light decks, laid at the level of the load-water line. In the midships below are cable tiers, and on each side, and for some distance before and abaft, the tier is filled in with cork, in water-tight cases. Eight delivering tubes, of 6 inches diameter, are carried through the decks of each boat, which are closed by Well's self-acting valves. Above the decks air-cases extend along the sides up to the level of the thwarts, and in the ends of the boats air-cases rise to the height of the gunwale; which latter, in conjunction, with an iron keel, give what is called the "self-righting" power. The cost of these boats is about £5 per foot; so that the expense of a moderately-sized life-boat, with carriage, boat-house, and gear all complete, can hardly be less than £300; to which is to be added the cost of the maintenance of the boat, such as keeping her in repair, and the expenses of a trained crew to manage her, which will, at least, involve another permanent outlay of about £30 per annum. We are glad to find that, during the last few months, several additional life-boat stations have been formed by this Institution along our coasts, and several old boats replaced by others of an improved construction, some of which have already done good service. There were present at the trials Captain Washington, R.N.; Captain Ward, R.N.; Lieutenant Ropestorff, of the Danish Royal Navy; Mr. Lewis, the secretary; Mr. Prowse, and several other gentlemen.

GRIFFITH'S SCREW PROPELLER.

An experiment of an important character, instituted under the direction of the Peninsular and Oriental Steam Navigation Company, was made on Thursday last at Southampton, with a view of testing the merits of Griffith's Patent Screw-propeller, in ships of large tonnage. For this purpose, the *Cadiz*, a new iron steamer of beautiful model, built by Messrs. Tod and MacGregor, of Greenock, of 950 tons burden, and 220 nominal horse power, was taken out on a trial trip to try the results to be obtained from this propeller, now fitted for the first time to one of the Company's ships. This form of screw has already been tried with success on board some of the ships of the Royal Navy, as already detailed by us, and as its construction has been already described in the *Mech. Mag.* an explanation of its merits is unnecessary. A number of gentlemen attended on board the *Cadiz*, which left the Docks at half-past 10 a.m., and proceeded to Stoke's-bay, where a series of runs were made at the measured mile, the results of which are as follow:

With Griffith's Patent Screw.

	Min. Sec.	Knots.		Feet.	Revolutions.
1st run ..	6·23 ..	9·399	Pitch of the screw	18	18¾
2nd — ..	6·32 ..	9·183	—	18	18¾
3rd — ..	5·40 ..	10·588	—	17	19
4th — ..	7·24 ..	8·108	—	17	19
5th — ..	5·33 ..	10·810	—	15	20¾
6th — ..	7·2 ..	8·530	—	15	20½
7th — ..	5·29 ..	10·942	—	13	23
8th — ..	6·34 ..	9·137	—	13	22
9th — ..	5·15 ..	11·428	—	11	24¾
10th — ..	6·13 ..	9·661	—	11	26

A few days since the *Cadiz* was tried with six similar runs, propelled by the ordinary screw, the result of which was an average speed of 10·20 knots. The mean speed of the two last trials of to-day being with the pitch of the screw at 11 feet 11·54, an improvement of about a quarter of a knot per hour in favour of Griffith's patent has been effected. The great advantage of this screw consists in the lessened vibration of the ship when under steam, and the facility with which it can be feathered and the pitch altered to accommodate the vessel when under canvas.

Just as the *Cadiz* got to Spithead she met the *Rajah*, a new vessel belonging to this Company, coming from London and bound for Southampton, whence she is to sail in a few days for India, to be employed as a steam collier in carrying coals from the Eastern Archipelago Company's mines at Labuan, in Borneo, to Singapore, for the use of the Company's fleet on the Indian station. The *Rajah* is of only 60-horse power, and will carry 600 tons of coal every trip.

The experiments were resumed on Saturday, some little alterations and adjustments having been found necessary by the previous trials. The object was to test the new screw under both steam and canvas, the wind on the previous occasion not having been sufficiently strong to use the sails. The first trial was made with the angle of the blades set at a coarse pitch, when the engines made 22½ revolutions with the fore and aft sails set. In this manner the *Cadiz* went from Southampton dock to Stoke's Bay—a distance of 14 miles—within the hour, and subsequently ran the measured mile, with a light breeze, as follows:

	Revolutions.	Steam.	Vacuum.	Time.	Speed.
1st run...	22½	10¾ lbs	26½	4m. 54 sec.	12·245
2nd run..	22¾	10	26¾	5 30	10·909

Mean speed 11·577 knots per hour.

The screw was now placed in a vertical position to test the vessel under canvas only, the angle of the blades being the same, and by the log the ship made 5 knots, and the same at the measured mile. The question next to be settled was, what would be the difference with the blades feathered fore and aft instead of being at the propelling angle. Some of the nautical gentlemen present estimated the difference of resistance would be equal to 2 knots, from experiments which have recently been made in the Channel with some of the Australian steamers. The blades were therefore adjusted fore and aft, and, there being no difference in the wind, the log showed precisely the same result as before, the ship in both trials steering admirably, the small surface and peculiar form of the blades of the propeller appearing to offer no impediment to the action of the rudder or to the speed of the ship. This point being satisfactorily settled, the blades were altered to a propelling angle of a finer pitch than before, and with this the engines made

25 revolutions during the return to Southampton.

The experiments made on Thursday showed how completely the propeller holds the engines, and thus provides for the control of the revolutions of the machinery, and the consequent consumption of fuel, by altering the angle of the blades. This is a most valuable feature for ships making long voyages; for whenever the vessel may be found to be getting short of coals, by increasing the pitch of the screw, the engines may be reduced in the number of revolutions; and although a very considerable quantity of coal would thereby be saved—say to the extent of 20 to 40 per cent., yet the speed of the vessel would only be lessened from one to two knots under steam alone.

The common screw with which the *Cadiz* was tried, about a fortnight since, was a three-bladed one of 12 feet diameter, having a surface of 47 feet. With this an average speed of 10½ knots was attained, the engines making 26½ revolutions, with 10½ lb. pressure. Griffith's screw, as fitted to the *Cadiz*, is only a two-bladed one, with a propelling surface of 21 feet; and so small did it appear when attached to this vessel, that many persons were inclined to doubt if it would drive the ship at all. It is now being fitted to Her Majesty's screw line-of-battle ship *Agamemnon*, and to the leviathan steamer, *Great Britain*, at Liverpool.

ON THE STABILITY OF LOCOMOTIVE ENGINES.

The following article on the principles to be observed in ensuring the greatest stability of locomotive engines, is taken from Mr. D. K. Clark's "Railway Machinery," and will be found to contain many valuable rules of practice:

It has been shown that the stability of the locomotive as a carriage depends mainly on the internal arrangement, the balancing of the revolving and reciprocating masses, the disposal of the wheels and axles, and the distribution of the load. Whereas, it has usually been held to be a necessary condition of steadiness that the axles should be equally loaded, and that the extreme axles especially should be well loaded; it appears that, however beneficial as a corrective, this condition can be viewed only as an expedient, and that, though it may lop off some of the grosser forms of instability, it leaves untouched the more deeply-seated and equally formidable disturbing causes. Further, it is found that, when the internal disturbing causes are balanced, and the extreme axles properly placed fore and aft, to control the suspended masses, great and valuable liberties may be taken with the general arrangement, and with the distribution of the weight upon the axles, without damaging the carriage qualifications of the machine. By a proper attention to detail, outside and inside, cylinder-engines may be made equally steady, the centre of gravity may be high or low, within practical limits, the driving-wheels may be placed anywhere, and the loads on the axles may be proportioned at pleasure, reserving a small proportion for necessary leading weight.

Balance of the internal disturbing forces.—The instability arising from the internal unbalanced action of the machinery is developed in four different forms of oscillation — sinuous, pitching, rocking, and reciprocating fore-and-aft movements. The first and last are caused by the reciprocating masses of the crank, piston, and connections, and by unequal admissions of steam to the front and back ends of the cylinders; the second and third by the oblique action of the connecting-rods on the guide-bars, due to the steam pressure, and by the direct pressure of the steam in inclined cylinders. With outside cylinders the action of these causes is better developed than with inside cylinders. The former irregular motions are removed by the application of counterweights in the wheels, between the spokes, equivalent, with outside cylinders, to the whole revolving and reciprocating weights of the crank, piston, and connections referred to the crank-pin, and exactly opposed to the crank; and, with cylinders inside, to about three-fourths of this weight, more or less, according to the greater or less width apart of the cylinders, not directly opposed to the crank, but diverging to one side towards the counter weight in the neighbouring wheel, when seen in side elevation. The other irregular movements are controlled and rendered harmless by an adjustment of the valve-gear to cut off the steam equally for the front and back strokes, by the use of a sufficiently long connecting-rod, at least six times the length of crank, by placing the cylinders horizontally, or nearly so, at an angle not greater than 1 in 10 for high-speed engines, and 1 in 8 for engines running under 30 miles per hour; and by regulating the flexibility of the springs. For all practical purposes, an angle of 1 in 14 is as good as a horizontal position for the cylinders; and for speeds under 20 miles an angle of 1 in 5 may be tolerated.

The advantages of balancing the machinery are, that the motion is steadier, the

straining of the engine and rails is less, there is less tear and wear of everything concerned, there is less resistance to the progressive motion on the rails, with the same power a higher speed is attainable, and the facilities for carrying out the most desirable arrangement of the machine are greatly increased.

Incidental causes of instability.—Instability is also occasioned and increased internally by a want of parallelism of the axles, which leads the carriage to run awry; by the play of the axle-boxes between their guards, which throws the axles off the square; by the wear of tyres into hollow sections, and by their unequal wear, forming wheels of unequal diameters, both of which results increase the oscillatory movements.

Engines are liable to vertical instability when the centre of the drawbar is above the level of the centre of the driving-axle, as the tendency of the difference of the level is to relieve the leading wheels of their load.

The external causes of instability, in the permanent way, are to be found in the form and clearance of the rails, and in their want of exact gauge. If the rails be flat-headed, either by the original section, by wear, bruising, or otherwise, the wheels find themselves running, in virtue of their conicity, on constantly varying diameters. A rounded head reduces the limits of this variation, and promotes stability. If the clearance of the rails and the wheel flanges, usually a total of half an inch, be locally reduced or increased, concussions laterally are increased in the first case, and in the second the rolling diameter of the wheel, when going straight ahead, is varied. A want of gauge laterally or vertically is similarly unfavourable.

Arrangement of the frame, the axle-bearings, and springs.—In general, outside bearings, springs, and frames should be employed for the merely carrying axles, and inside bearings alone for the driving and coupled axles. The duplicate frame-plates required on each side for this purpose, when properly united, greatly increase the strength of the frame; and abundance of room is made for the springs and their connections. The lateral spread of bearing is specially useful for outside cylinder engines. In goods engines, with all the axles coupled, inside bearings alone should be employed. For engines under twelve to fifteen tons weight, inside bearings only may be used, for simplicity of framing, and in consideration also of the lighter loads, and the greater space for the stowage of inside springs. The springs may be linked, for the sake of compensation, in some of the ways already described, particularly in coupled engines.

Arrangement and number of the axles.—Stability depends greatly on the arrangement of the axles and springs; and the necessary conditions are regulated by the speed on the rails. 1st. For high-speed engines, or such as are destined to run above 20 to 25 miles per hour, the machine must be well supported fore and aft; the centre of the leading axle should, in all cases, be within 12 inches from the smoke-box tube-plate, or from the back of the cylinders, when these are in front; or at least not more, in any case, than 30 inches from the mid-length of the cylinders. The trailing axle should invariably be behind the fire-box, as closely as otherwise desirable, to limit this wheel base; though this condition may, perhaps, be relaxed in the case of light engines under 12 tons, with four wheels. 2nd. For low-speed engines, running under 20 miles per hour, the foregoing conditions should be attended to when convenient. One axle may, however, be withdrawn, in engines under 18 tons total weight, leaving only two axles; and the firebox may be overhung without injury to the carriage; the cylinders, whether inside or outside, may also be placed horizontally, and overhung sufficiently to clear the leading wheels, as in Nos. 8, 14, 31, 35, of diagram-plate 6.

In engines with independent wheels the axles should be arranged with reference to the loads they require. The leading axle demands weight to keep the wheels to the rails, and the driving axle requires weight for adhesion; the two axles have separate functions, and they should not be identified or combined in one, as in No. 10, diagram-plate 6. In well-balanced and well-arranged engines, one-fourth of the total weight is, we believe, necessary and sufficient for the leading wheels. The position of the leading axle being fixed as above specified, the best position of the driving axle is in front of the fire-box, as there the greatest amount of driving load is available, out of a given total weight of engine. If behind the fire-box, it cannot receive above one-half of the whole weight, as it involves an equal and unnecessary outlay of leading weight, and, upon the whole, a weightier engine for the same driving load. Comparing Nos. 7 and 34, diagram-plate 6, we have the following total and driving weights;

	Position of driving-wheel as to fire-box.	Total weight.	Driving weight.
		Tons.	Tons.
No. 7 (Bury),	In Front	20¾	12
No. 34 (Crampton),	Behind	27	11¼
	Difference,	6¼	

From this it is apparent that a 20-ton ordinary engine commands as great a

driving load as a 27-ton engine with hind drivers; while, if balanced, it runs equally steady.

It follows that, if the driving axle should lie in front of the fire-box, an extra pair of wheels are required behind; and a six-wheeled engine is the result. The trailing-axle does not require above 1 or two tons of load, as its function is simply to receive and absorb the pitching of the engine. Thus, the advantage of ordinary four-wheeled engines, in securing a large proportion of driving load, may be substantially combined with the utility of an extra axle behind. In 6-wheel engines with central drivers, the rails, it is true, are liable, as observed by Mr. W. B. Adams, to deflect under the driving load, if excessive, and to throw it partly on the end wheels, causing the engine to slip; and this is a circumstance which with extreme drivers cannot take place. The true remedy is not, as has been argued by the advocates of four-wheeled engines, to remove the trailing-wheels, but to stiffen the rails; and, besides, the central springs may be made of great flexibility, to follow up the deflections of the rails without materially reducing the driving load.

Consistently with stability, then, one-fourth at least of the total weight should be placed on the leading axle, and one-twelfth on the trailing axle, and the remainder, or two-thirds, on the driving axle. But 12 tons is the greatest load, with regard to the rails, that ought to be placed on one pair of wheels. Now, 12 tons are two-thirds of 18 tons, therefore 18 tons is the greatest useful weight of single-wheel engines, with respect to their available traction loads, as the extra weight of heavier engines must be borne entirely on the leading and trailing axles. Accordingly, Sharp's engine, No. 5, of 18 tons, would, were the driving axle nearer the firebox, command as great a traction load as Bury's, No. 7, of 20½ tons, and Wilson's and Hawthorn's, Nos. 6 and 8, of 27 tons; and the extra weight of these engines is useful only as it represents greater steam-producing power. As a high-speed, steam-producing engine, Crampton's, No. 34, of 27 tons, is on a par with the others, as it is heavy enough to command the practical maximum of driving load: but for total weights of less than 24, or twice 12 tons, Crampton's arrangement is inferior to the others, as respects the available traction load.

It follows, that passenger-engines above 18 or 20 tons weight should have one of the axles coupled, to admit of the distribution and useful employment of the extra weight; except such as are chiefly employed to run at express speeds, in which the desiderata are great evaporating power and free running, with a moderate driving load.

In coupled engines the main point in the distribution of the weight is to equalise the load on the coupled axles, without throwing any superfluous load on the disengaged wheels, if there be any. With the hind wheels coupled, a total of 32 tons is required to yield 24 tons, the maximum of driving weight on two coupled axles, namely, one-fourth or 8 tons leading, 12 tons driving, and 12 tons trailing; with the fore wheels coupled, the total is 26½ tons, namely, 12 tons leading, 12 tons driving, and one-twelfth, or 2½ tons, trailing; with all the wheels coupled, 24 tons would yield the same traction load. Thus, to yield the same traction load, the total weights of the three classes of coupled engines, when their leading and trailing loads are duly attended to, are as 32, 26½, 24, or as 1·33, 1·1, 1, respectively, for coupled hind wheels, coupled fore wheels, and six wheels coupled.

Upon the whole, six-wheeled engines with the hind-wheels coupled appear to be the best arrangement for four coupled-wheel high-speed engines, as the leading wheels, charged with a suitable load, are free for their proper function, and are unburdened with driving weight; with outside cylinders no other arrangement is properly available, as the leading wheels should be free and of smaller diameter, to permit of a suitable adjustment of the cylinder at a moderate inclination. When the hind-driving load is materially inferior to the middle load, it may be increased by the application of extra dead weight over the axle, in the form of a heavy foot-plate of cast-iron, or otherwise.

The loads on the axles are regulated by their relative distances from the centre of gravity of the whole machine. There is great uniformity in the locality of the centre of gravity, in similarly-arranged engines. In engines like Nos. 6, 18, 19, 20, with 10½ to 11-feet barrels, and large fireboxes, the centre lies about 7½ feet from the fore-end of the barrel, or 3 feet in front of the firebox-shell. In these cases, the firebox and the trailing-wheels appear to balance the greater part of the barrel, the cylinders and gearing, and the leading wheels. In other cases, as Nos. 14, 17, and 31, the extra length of barrel is neutralised by the advance of the hind-wheels, aided, in the first and third cases, by the greater overhang of the cylinders, and the centre is, as in the others, about 7½ feet from the front of the barrel. In Nos. 5, 30, and 42, with shorter barrels and shorter fire-boxes, and very advanced driving-axles, the centre is 12 to 15 inches nearer the front, and is still 3 to 3½ feet before the firebox-shell.

Now, a 10½-feet barrel gives an 11-feet tube nearly, which is a length suitable for every size of boiler; length of boiler, also, in so far as it involves length of carriage, is conducive to stability; besides that, independently of the magnitude of the machine, the length must bear a sufficient ratio to the gauge of the rails; moreover, the driving-axle must clear the back of the cylinder sufficiently to make room for connections. The length of barrel, therefore, should not be less than 10 or 10½ feet, and we have the certainty of finding the centre of gravity considerably in advance of the firebox.

The normal arrangement (No. 4) of the locomotive as a carriage, elaborated by Stephenson, appears, upon the whole, to be the most generally excellent, and will be adhered to as such in the discussions which follow. The general features are—cylinders in front, horizontal; six wheels, of which the drivers are in the middle, in front of the firebox, and the trailing wheels behind it; boiler of the usual form, with horizontal tubes.

For passing freely along curves, the leading and driving wheel-flanges should be kept up to the full section, 1¼ inch thick, with ¼ inch clearance on each side, or a total of ½ inch; and the trailing wheels should be formed either plain, or with thinner flanges, according to circumstances. If the driving-axle be well up to the firebox, and the hind load under 2 tons, the hind-wheels should not be flanged, as, in backing into sidings, &c., they take the lead, and may be insufficient to control the whole mass; and, consequently, with flanges, they may over-ride the rails, and lead the engine off the line. If the hind load be materially above 2 tons, the wheels should have thin flanges, five-eighths or three-fourths of an inch thick, with at least three-fourths of an inch clearance on each side, to allow free running ahead, and to lead the engine in backing. The hind flanges might indeed be removed, even when loaded sufficiently for leading, where the driving-wheels are placed well back, as the driving flanges might lead the engine in backing, just as in a four-wheel engine; this is not done, however, with the same facility, because the hind wheels, with their loads, have a leverage upon the drivers, and offer a resistance to the lateral translation to which they are subjected on curves; this increases the duty of the drivers, and is an extra duty to which they are not subject in four-wheel engines. Hence the propriety of removing the hind flanges when lightly loaded, for safety in backing, and of retaining them, when sufficiently loaded, for facility in backing. This is a safe general rule; or, when the back loads are light, the driving-wheels are necessarily well back and well placed for leading backwards; and when the drivers are too far forward to lead well in backing, the hind wheels are necessarily well loaded, and suitably qualified to lead. Thus the steadying or wheel base remains unrestricted, while the acting flange-base is suitably limited. On this system, the driving wheel-flanges are designed to take the chief centrifugal strain of the engine, throwing the front wheels free for leading. Upon inside cranks having inside bearings alone, as they ought to have, this strain does not operate injuriously; for concussion, not mere pressure, is what ruins an axle.

When the cylinders are outside and overhung in front, the leading wheels, when free, may be 3½ feet diameter with 6-feet driving wheels, 3 feet 9 inches with 6½-feet wheels, and 4 feet with 7-feet wheels. For inside cylinders they may be 3½ feet with 5-feet driving wheels, 4½ feet for 6-feet wheels, and 5½ feet for 7-feet-wheels. In all cases they should be as large as possible, consistent with the due arrangement of the engine. The hind wheels, when free, may be of the same diameters as those just given for the leaders. It is a bad practice to assume, as is commonly done, that, on the score of safety, single leading-wheels should not exceed 4 feet. In all cases, the leading axle-guards must be well bound and practically inflexible, to discourage oscillation, and keep the head of the engine to the rails. In coupled engines, the leading axle should, when practicable, be left free. When free, it should not be heavily loaded; it should have outside bearings and springs, to increase the stability, and the accommodation for springs, &c. The middle axle-guards, on the system of the reduced flange-base, must also be inflexible, for which their shortness and strength are favourable. The hind-axle-guards may and should possess some flexibility, to ease the engine over an occasional hitch.

The buffing springs between engine and tender should be of very moderate strength, equivalent, in fact, to such as are applied between carriages.

Swivelling bogies at the front of the engine, carrying two pairs of leading-wheels, are recommended for lines on which the ruling curves are of a ¼-mile radius or less. Loose wheels on the axles, rolling independently of each other, though undoubtedly of some advantage on curves, have not, as yet, been made to work well in practice. From what is known of ordinary carriage-wheels, there seems no doubt of the feasibility of loose wheels on railways.

The following Table shows the suitable Distribution of the Total Weight on the Axles of Uncoupled Six-wheel Engines. From 9 to 18 tons Total Weight.

Total Weight.	Distribution of the Weight.					
	Leading Axle		Driving Axle.		Trailing Axle.	
tons.	tons.	cwt.	tons.	cwt.	tons.	cwt.
9	2	5	6	0	0	15
10	2	10	6	13	0	17
11	2	15	7	7	0	18
12	3	0	8	0	1	0
13	3	5	8	13	1	2
14	3	10	9	7	1	3
15	3	15	10	0	1	5
16	4	0	10	13	1	7
17	4	5	11	7	1	8
18	4	10	12	0	1	10

For single engines above 18 tons, the distribution of the weight is a matter of indifference, beyond the placing of 12 tons on the driving wheels, and one-fourth of the whole weight upon the leaders.

RETIRING PENSIONS TO ENGINEERS IN THE ROYAL NAVY.

It has reached us from a source upon which we can place complete reliance, that at length it has been determined by the Government that engineers in the Royal Navy shall be entitled to retiring pensions, or superannuation allowances, when permanently disabled for further service by accident, illness, or otherwise. An order in council has been signed by Her Majesty, carrying this meritorious determination into effect, and the following, we understand, is the scale of allowances to be made in the several grades of this branch of the service. Inspectors of steam machinery afloat are to have from £130 to £180 per annum. Chief engineers' allowances will vary according to their length of service. If they have served for 12 years, they are to have from £110 to £130; if for 6 years, from £85 to £105; if for 3 years, from £75 to £90. Assistant engineers' allowances will also depend upon length of service. If they have served for 20 years, they are to receive from £65 to £75; if for 10 years, £50 to £60; if for 3 years, £40 to £50. The justice of awarding pensions to naval engineers is a point for which we have long contended; and the concession of which, while it tends to promote a healthy emulation in this important department, redounds very much to the credit of the Government by which it has been made.

The Mississippi and Ohio Rivers. Containing Plans for the Protection of the Delta from Inundation; and Investigations on the Impractibility and Cost of Improving the Navigation of the Ohio and other Rivers by means of Reservoirs; with an Appendix on the Bars at the mouths of the Mississippi. By Charles Ellet, J. R., Civil Engineer. Philadelphia: Lippincott, Grambo, and Co.

We have perused this volume with considerable interest. The immensity of the subject upon which it treats so far exceeds any British, or even European example, as to excite a bewildering astonishment in the mind of an English reader. The rapid growth of agriculture and of commerce in the United States—in itself the greatest political wonder of the age—is here manifested in a manner which anticipates all our calculations by at least a century. Can it be possible that upon the vast surface of the North American continent, men should already begin to jostle each other for elbow room?—That in a space of time but little exceeding human memory, and in a country apparently of illimitable extent, the ever-busy industry of our Saxon intelligence can have indirectly made such changes in the course and volume of the mightiest of rivers, as to render the works indicated in the volume before us necessary? We have had in our country numerous examples of the successful application of labour and skill to the guidance and deepening of rivers, the reclaiming of land from the sea, and the draining of fens and lakes; and these, too, upon what we have thought a somewhat large scale. But if all that we have done in this way, throughout the history of the island, could be summed together, it would sink into utter nothingness when compared with what has been done, and is to be done, on the shores and in the bed of the Mississippi—the father of the waters. How much has been written, and how much more has been said, both in and out of Parliament, on the condition of the Thames and its London affluents—Fleet Ditch and its fellows — with all their abominations? and how much has been done in the treatment of this 16 square miles of surface? Why, nothing. It would seem that enterprise is paralysed amongst us, or that the wealthiest community upon

earth is content with an abridgment of days—a nauseating life and a short one. The supply of London with water, and the purification of the fœtid ditch which flows under our bridges, is a work either beyond our powers or our wishes. Let us see what a transplanted generation of Englishmen can do, and are doing, not upon an area of 16, but of 40,000 square miles,—not with a small part of a paltry rivulet of 250 miles in length, but with 2,000 miles, or one half of the largest river in the world.

The total area drained by the Mississippi is 1,226,600 square miles. The mighty tide which it pours into the ocean is equal to 103,750,000,000 cubic feet per diem. Here is a field for enterprise, and one upon which our American brethren have entered with their usual energy and discretion. The book before us is a most careful and elaborate survey of the valleys of the Mississippi and of the Ohio, with the view to improvements in the navigation of these rivers, the prevention of the floods to which they are subject, and the effective drainage of the valuable and fertile plains through which they flow. The geological conditions of the Delta of the Mississippi, its gradual formation and advance seaward, its comparative elevation at times above the levels on its banks, the loss of property occasioned by this cause, and the means of protection from such loss, are severally treated with a minuteness of detail, a philosophical research, and a thorough comprehension of remedial resources, as to give at once a most impressive notion of the gigantic agencies to be controlled, and of the capacity of the engineer for the task he has undertaken.

The delta of this river—equal in extent to a moderate kingdom—is merely a deposit from its waters. This process of deposition, which has already elongated the stream nearly 1,200 miles, is still going on, and when it is considered that the quantity of rain which annually falls into the basin of the Mississippi — all of which must be drained by the river, or carried off by evaporation—amounts to the astounding sum of 113,985,484,800,000 cubic feet, it is evident that so long as this basin presents a surface so loosely aggregated as to be susceptible of suspension in water, so long will this deposition continue. The effect of human industry upon the economy of this enormous river has become perceptible in a manner which was not likely to be foreseen, but which it is now necessary to modify. A vast portion of the delta has been subjected to cultivation. Embankments have been thrown up, to confine the river to its own bed, through a great portion of its course, and the consequence is, that in times of flood, the waters which formerly diffused themselves over the neighbouring low lands, are more or less restrained in this part of their course, and fall with greatly increased volume upon the districts below. The means by which it is proposed to regulate the currents are highly ingenious, no doubt practicable, and having also the great advantage of maintaining at all times that depth of water in the Ohio and other tributaries, which is essential to continuous navigation. The improvement of the embouchures of the river are not lost sight of, and the investigations of Mr. Ellet upon this subject have led him to what we believe to be the true theory of the formation of bars at the mouths of rivers, and the suggestion of simple and effectual means for their removal and prevention. This part of the subject is of general interest, and will be found as well adapted to many of our localities as to those of the Mexican Gulf.

The author well observes in his preface, "Containing the views of a practical engineer on the grandest and most difficult branch of his profession, with which the skill and science of men have yet attempted to cope, and foreshadowing a new and extensive department of civil engineering, it has been thought by the publishers that apart from all the local and great pecuniary interest which the subject involves, along the Mississippi, this work could not fail to command the attention and excite the interest of many professional and scientific readers." In this opinion we entirely concur; and in taking leave of this very interesting work, we cannot but express our pleasure at the proof it affords us of the advanced state of typography and its concomitants, paper-making and binding, in the United States.

The Engineer and Machinists' Drawing-book: A Complete Course of Instruction for the Practical Engineer. Blackie and Son.

The Fourth Part of this excellent work on mechanical and geometrical drawing has just made its appearance, and well maintains the character which the preceding ones have bestowed upon it, as a course of instruction in the art of the draughtsman. This portion of the work contains the geometrical part of the subject, and includes a large number of constructions in which circles and equilateral polygonal figures are concerned. These are conveniently subdivided into problems referring to particular objects in engineering and in the arts, and

their application in each is clearly pointed out. A copious and valuable account of the uses of the drawing-board, the T-square, and the triangles frequently combined with them, exhibits the manner in which these geometrical constructions are facilitated and rendered more accurate, when it is necessary to combine them. The formation of pavements is very clearly explained, and an entire section is devoted to the subject of geometrical proportion, in which the manner of finding mean, third, and fourth proportions is fully gone into. A calculation of problems on the ellipse and the parabola, in which the more important properties of those curves, with reference to objects of science and art, and the methods of their accurate and approximate construction are given. The text is profusely illustrated with figures, which can scarcely fail of suiting the humblest powers of abstraction; and four large sheets of beautifully engraved figures are included in the part. These contain the projection of helical curves and surfaces, and of their shadows upon planes, and upon themselves, the oblique projection of a spur-wheel, and finished engravings of the parts of a high-pressure steam-engine. This course of mechanical drawing, therefore, is being pursued in strict accordance with the admirable plan upon which it was originally projected; and is an invaluable acquisition not only to the student, but to him also who, without aiming at becoming a draughtsman himself, desires to acquire the power, from reflection and study, of realizing the exact figure of the object, and which in general can only be delineated by the aid of numerous plans, sections, and elevations.

A Treatise on Gas-works, and the Practice of Manufacturing and Distributing Coal-gas; with some account of the most improved methods of distilling Coal in Iron, Brick, and Clay Retorts, and of the various modes adapted for purifying Coal-gas; including also a chapter on the Hydro-carbon, or Water-gas, and on the rating of Gas-works in parochial assessments. By SAMUEL HUGHES, C.E. John Weale.

So rapid is the progress of manufacturing industry, and the development of what were once called the mysteries of the laboratory and the workshop,—so important are the triumphs which an intellectual generation is from day to day achieving—and so eager is the demand for constant information upon every subject, that the appearance of a new book upon a subject upon which much has already been written, must be taken merely as evidence of progress. The pretensions of the work before us, as disclosed by its title-page, are amply borne out by the information it affords, by a careful analysis and estimate of the processes it describes, and by the correction of such errors as have crept into the books which have preceded it. The subject of gas-lighting has become of so great an importance in our social economy, that it is scarcely possible to over-estimate the labours which have brought it to its present state of advancement, or to predict what further progress this very interesting manufacture may make under the increasing supervision of the highest science, aided by inexhaustible capital.

A perusal of Mr. Hughes' excellent treatise will well repay even the general reader, as well by the instruction it will afford on the history, progress, and advanced position of this very useful application of science, as by the evidence it bears to the vigour and efficiency—so to phrase it—with which fair science braves the rude contact of smoke and fire, gladdening with her smiles the labours of her votaries, as well in the lurid glare of the gas-house, as in the glorious sun-light, or under the milder radiance of "star-bespangled night."

The gas-inquirer will find in Mr. Hughes' treatise, not only a clear and minute description of every known arrangement of apparatus for the distillation of coal, the purification, storing, and distribution of gas, but the most practical directions for the construction of tanks, the laying and jointing of mains and service-pipes, not only as practised in England, but also in America and in France. The comparative analysis of coals, and the determination of their value for illuminating purposes, the various modes of testing the gaseous products, and a complete elucidation of the most approved methods of photometric observation, are very prominent and important features of this book. Indeed, Mr. Hughes has shown throughout an enlightened industry, which seems to have left nothing to be desired; and it seems that until—what, indeed, may occur to-morrow—some further step be taken in the production of artificial light, we are not likely to be called upon again to notice a treatise upon this interesting subject. Mr. Hughes has very judiciously appended to his highly useful work a chapter or two on the assessment of gas-works for parochial and other purposes, which will be found of first-rate importance to all parties interested in this rather obscure

operation, so frequently productive of litigation and other difficulties. His observations on this subject, involving as it does an immense amount of capital, are worthy of careful study on the part of all those who are interested in the prosperity of these vast undertakings. He has evidently been at great pains to investigate the true principles of rating; and, as in the mechanical, chemical, and philosophical parts of the subject, he has brought a great amount of research to bear upon its illustration, and has collected his information from a widely-extended field of scientific and legal literature.

Of the general value of the work for practical purposes, it is impossible to speak too highly. It is illustrated by a profusion of well-executed wood engravings, the subdivision of the work is excellent for facility of reference, and the numerous topics necessarily included in such a work, besides being copiously and elegantly described, are more completely brought within the reach of the practical engineer by the addition of working estimates, and specifications of well-known gas establishments of the most approved construction and arrangement. In short," Mr. Hughes' treatise on gas-works constitutes a most valuable extension of the excellent series of books for which the engineering public have been indebted to Mr. John Weale, of Holborn—a gentleman who has laboured long and earnestly in the development of scientific and mechanical ingenuity. We venture to predict for it a very considerable circulation throughout the kingdom, and upon the continent, and wherever it comes it will certainly be appreciated.

SCREW PROPULSION IN THE PENINSULAR AND ORIENTAL STEAMERS.

The introduction and gradual extension of the screw in the fleet of the Peninsular and Oriental Steam Navigation Company affords a remarkable illustration of the favour into which that principle of marine propulsion has grown with our engineers. Formerly the whole of the extensive steam operations of this Company were conducted exclusively by vessels on the paddle-wheel principle. Subsequently the Directors were induced to apply the screw as a motive power in ships of moderate tonnage; the results being satisfactory, as instanced by the performances of the *Madras*, *Bombay*, *Formosa*, *Chusan*, and some other vessels, an inducement to a further extension of the principle was afforded, and the *Bengal* was built, a ship of 2,250 tons, with machinery of 470-horse power. The success of this vessel has been extraordinary in point of speed; and it is considered, by the most competent judges, that that vessel has achieved a complete triumph over the more costly paddle-wheel steamers. The Peninsular and Oriental Company has now announced its determination gradually to discard the paddle-wheel in the whole of its extensive service. The existing vessels on the old-fashioned principle are to be allowed to wear out, while all the new fleet now building for this Company, including the gigantic steamer *Himalaya*, of 3,500 tons; the *Simla*, of 2,600 tons; the *Candia*, 2,200 tons; the *Colombo*, 1,900 tons; the *Pera*, 2,200 tons; the *Nubia*, 2,200 tons; and others, are to be fitted with the screw. It is even in contemplation to convert some of the existing paddle-steamers into screws; and the *Haddington*, a ship of 1,600 tons, requiring immediate repairs, is, we are informed, to be operated upon in this way. This determination having been arrived at, it is now the object of this Company to discover the most economical method of applying the system, and to ascertain the precise merits of the numerous varieties of the screw now pressed forward upon their attention by inventors and scientific men. It was in this view that the experiment with Griffith's propeller, noticed in another column, was instituted.

The great importance of the successful application of the screw in preference to the paddle-wheel, by large steam-packet companies, may be instanced by the case of the *Bengal*. That vessel now occupies the Southampton, Malta, and Alexandria station, where an immense passenger-traffic has to be conducted. The *Bengal* is of iron, with only 470-horse power and 2,250 tons burden, which is the size of the *Orinoco*, *Parana*, and *Magdalena*, belonging to the Royal Mail Steam-Packet Company, carrying the mails to the West Indies; but those vessels are paddle-wheeled packets, of 750-horse power. It is said that the *Bengal*, with little less than two-thirds such power, makes a far greater speed than has ever been attained by these West India steamers. But the advantage of increased speed is not the only one; the consumption of coals in the *Bengal* is 45 tons per diem, while the *Orinoco*, *Parana*, and *Magdalena* each burn from 85 to 90 tons daily. The *Bengal* having, therefore, so much less fuel to stow away, can carry a greater amount of freight; and could, for a voyage to St. Thomas, carry 700 to 800 tons of measurement goods, while the West India steamers, having to be burdened at starting with 1,200 tons of coals, cannot accommodate over 250 or 300 tons of goods. The ques-

tion, therefore, becomes a commercial one of much interest; for it follows that if such a ship as the *Bengal* could run to and from St. Thomas as quickly as the *Orinoco* and other steamers of that class (of which there is now no doubt), and if the expenditure of fuel is just one-half, while far greater earnings in freight could be secured by the increased available capacity of the screw-steamer, then the profit of employing steamers of the *Bengal* class would be immeasurably greater than that of such vessels as the existing new West India steamers. There are other considerations also. The cost of building and equipping the *Bengal* was about £70,000, while the *Orinoco* cost about £95,000 to £100,000; and, again, the wear and tear of the screw-steamers would be less than half that of their paddle-wheel rivals. With these facts and inferences, it is therefore not singular that great importance attaches to these experiments and to their practical results, or that the Peninsular and Oriental Company have decided to avail themselves of the extraordinary advantages, in a pecuniary point of view, which present themselves to their notice in adopting and improving the screw-propeller.

SPECIFICATIONS OF ENGLISH PATENTS RECENTLY ENROLLED.

George Shaw, of Birmingham. *For certain improved machinery for making envelopes and bags.* (A communication.) Patent dated December 17, 1852.

The improvements claimed under this patent comprehend,

1. The application of adhesive matter as a means of feeding or supplying envelopes or other blanks to folding or creasing machinery.

2. The employment of elastic revolving surfaces in combination with a plunger, for folding and creasing envelopes and bags.

The *first* improvement applies mainly to machines constructed on the patented plan of Mr. A. F. Rémond, of Birmingham, and is intended to be employed as a substitute for the pneumatic feeder, by which the blanks were singly lifted from a pile and transferred to the folding or creasing part of the machine. The adhesive substance employed is India rubber, which has been wetted with turpentine, and the turpentine lighted so as to burn and partly melt its surface. The more liquid portions are wiped off, and the material then left in a sufficiently adhesive state for use.

The *second* improvement is carried into effect by using four India-rubber covered rollers to form the sides of the folding-box, and a rather sharp-edged plunger to force the blank down between the sets of rollers, and thus fold it for subsequent operations.

Robert Burn, of Edinburgh, Scotland, practical engineer. *For a certain improvement in steam engines.* Patent dated December 21, 1852.

Mr. Burn proposes to adapt to engines of all classes certain mechanism, consisting of crossheads and side-rods by which the motion of the piston-rod is transmitted to the crank-shaft, in lieu of adopting the ordinary arrangements for this purpose. He gives a diagram of a horizontal cylinder-engine thus fitted, in which a crosshead is keyed to the end of the piston-rod, which crosshead is connected by side-rods moving parallel to the piston-rod, with a second crosshead, which latter has attached to it a guide-rod for keeping it steady. The connecting-rod is worked from the second crosshead, and by this arrangement the friction is reduced below what is usual in direct acting engines.

Mr. Burn claims the mechanism consisting of cross-heads and side-rods, adapted and applied so as to form an intermediate means of communicating or transmitting motion from the piston-rod to the crank-shaft.

Robert Galloway, of Cartmel, Lancaster. *For improvements in manufacturing and refining of sugar.* Patent dated December 21, 1852.

This invention consists in employing lime combined with lead, or saccharate of lead, or other combination of lead capable of acting in a similar manner to the plumbite of lime in defecating saccharine solutions. Also, in using saccharate of lead when acetate of lead is employed, combined with the use of lime or magnesia previous to or after the acetate of lead in refining saccharine solutions. Also, in employing acetate of lead twice, some other process being adopted intermediately; and in using bicarbonate of lime, or bicarbonate, or carbonate of magnesia for neutralizing the acetate of lead. And also, in utilizing and recovering the used lead by employing acetic acid to act on the scum so as to obtain the lead in the form of an acetate for further use.

PROVISIONAL PROTECTIONS.

Dated April 19, 1853.

940. William Hale, of Swan-walk, Chelsea, Middlesex, engineer. New kinds of fire-arms.

Dated May 9, 1853.

1134. Edward Blackett Beaumont, of Wood-hall, Barnsley, York, gentleman. Certain improve-

ments in the mode of constructing dwelling-houses or other buildings, and in peculiar-shaped bricks and tiles to be used for the purpose.

Dated May 27, 1853.

1306. Aristide Michel Servan, of Philpot-lane, London. Improvements in treating fatty matters to render them suitable for the manufacture of candles.

Dated May 28, 1853.

1312. William Smith, of Salisbury-street, Adelphi, London, civil engineer. Certain improvements in the machinery for and method of making and laying down submarine and other telegraph cables, which machinery is also applicable and is claimed for the making of ropes and cables generally.

Dated May 30, 1853.

1332. Richard Archibald Brooman, of the firm of Robertson, Brooman, and Co., of Fleet-street, London, patent agent. Improvements in fire-arms. A communication.

Dated June 1, 1853.

1340. Edward Wilkins, of Queen's-road, Walworth, Surrey, gentleman. Improvements in pots and vessels for the growth and cultivation of plants.

1344. Jaques Louis Lemaire-Dalmé, of Paris, France. Certain improvements in play-arms, such as play cannons, pistols, and guns.

Dated June 2, 1853.

1348. William Knowles, of Bolton-le-Moors, Lancaster, cotton-spinner. Improvements in machinery for warping and beaming yarns or threads.

1349. Joseph Whitworth, of Manchester, Lancaster, engineer. Improvements in machinery for cutting and harvesting corn, grass, and other crops.

1350. Joseph Whitworth, of Manchester, Lancaster, engineer. Improvements in machinery for perforating or punching paper, card, and other materials.

1351. John Robert Johnson, of Stanbrook Cottage, Hammersmith, Middlesex, chemist. Improvements in the manufacture of type and articles used in letter-press printing.

1352. William Thorold, of Norwich, civil engineer. Improvements in the construction of portable houses, and in machinery for raising, moving, and lowering the same.

1353. Richard Longden Hattersley, of Keighley, York, machine-maker. Improvements in machinery for forging iron and other metals.

1354. William Hammond Smith, of Gloucester-row, Walworth. Improvements in the manufacture of parchment.

1355. Antoine Remi Cyr Madoré and Daniel Neuberger, of Paris, France. Certain improvements in the manufacture of shirts.

1356. Hesketh Hughes and William Thomas Denham, both of Cottage-place, City-road, Middlesex, manufacturers. Improvements in machinery for weaving.

1357. Robert Smith Barleet, of Redditch, Worcester. Improvements in the manufacture of needles.

1358. Nicholas Marshall Cummins, of Cork, and John De Cock Kenifeck, of Belfast, Ireland, gentleman. Improved machinery for removing the seed from flax and other plants, and breaking the bolls or pods.

1359. William Boyd, of Belfast, Ireland, manufacturing chemist. Improved apparatus for manufacturing chlorine or chlorides.

1360. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the manufacture of soles for boots, shoes, and other coverings for the feet. A communication.

Dated June 3, 1853.

1361. William Wahler, of Myddleton-street, Clerkenwell, lithographic printer. An invention for lithographic printing, being a self-acting lithographic printing-machine to be propelled by hand, steam, or other motive power.

1362. Jean Durandeau, junior, of Paris, France, of the firm of Durandeau, junior, and Chauveau. Certain means of obtaining marks and designs in paper.

1363. Ferdinand Louis Gossart, of Rue Montmartre, Paris, France. A system of permanent circulation of caloric, intended to produce and overheat steam, gas, and liquid.

1365. James Spotswood Wilson, of Tavistock-place, Russell-square, Middlesex, civil engineer. A machine or apparatus for digging or raising earth, and applicable to agricultural or engineering purposes.

1366. Isaiah Kendrick, foreman to Messrs. Horton and Son, of Southwark, Surrey. Improvements in steam boilers.

1367. Thomas Barnabas Daft, of Lezayre Lodge, Isle of Man. Improvements in inkstands.

1368. Richard Robbins, of Dunchurch, Warwick, corn-miller. Certain improvements in mills for grinding wheat and other grain.

1369. James Hayes, of Elton, Huntingdon, iron-founder. Improved machinery for raising and stacking straw, hay, corn, and other agricultural produce.

1370. William Edward Maude, of Liverpool, Lancaster, merchant. Improvements in carriages. A communication.

1371. William Edward Maude, of Liverpool, Lancaster, merchant. Improved apparatus for steering ships. A communication.

Dated June 4, 1853.

1372. Carl Fedot Lens, merchant, of Berlin, Prussia, and Great Titchfield-street, Middlesex. A mechanism of a new construction, having as its end the prevention of the loss of force caused till now by friction, to diminish the oiling till now necessary, and to prevent the heating of the axletrees in revolving. Partly a communication.

1373. William Bradburn, of Shiffnall, Salop, farmer and dealer in artificial manures. Improved manufacture of greases and oils.

1374. Joseph Gyde, of Tooley-street, Southwark, Surrey, millwright and engineer. Improvements in mills and apparatus for grinding and dressing corn and various substances.

1377. Henry John Betjemann, of New Oxford-street, Middlesex. Improvements in chairs.

1378. Edward Blackett Beaumont, of Wood-hall, Barnsley, York, gentleman. Certain improvements in bricks or tiles.

1379. Joseph Burch, of Craig-hall, near Macclesfield, Chester, carpet-manufacturer. Certain improvements in fans, blasts, or blowing apparatus.

1380. William Dray, of the firm of William Dray and Co., of Swan-lane, London-bridge, agricultural implement-makers. An improved method of driving shafting.

1381. Benjamin Biram, of Wentworth, York, gentleman. Improvements in working and ventilating mines.

1382. Thomas Russ Nash, of Leigh-street, Middlesex, surveyor. Improvements in filters.

1383. Christian Schiele, of Oldham, Lancaster, engineer. Improvements in pressure indicators.

1384. John Whitehead, of Preston, Lancaster, implement-maker. Improvements in manufacturing pipes or hollow articles from plastic materials.

1385. Thomas Richbell, of Lambeth, Surrey, architect. Improvements in the application of slate for building purposes.